U. S. Government
RESEARCH REPORTS

August 20, 1961
Vol. 36, No. 4

THE UNIVERSITY OF MICHIGAN
AUG 24 1961
CHEMISTRY LIBRARY

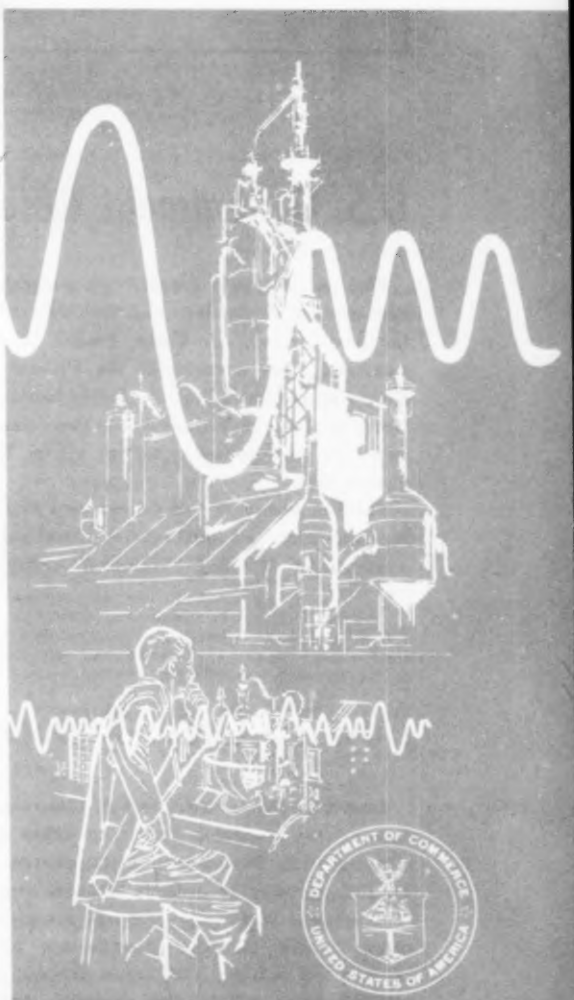
. . . available to science and industry . . .

Chemistry
Z
7913
.U58

The reports listed in this publication, unless otherwise noted, are available from the Office of Technical Services, U.S. Department of Commerce, at the prices indicated. They may also be ordered through Department of Commerce Field Offices.

The Office of Technical Services collects and distributes the research and development reports of the Army, Navy, Air Force, Atomic Energy Commission, and other agencies of the Federal Government for the use of private scientific and industrial firms and organizations in the development of new products and processes and in making technological improvements.

This publication is issued twice a month to announce new material available through the Office of Technical Services, which sells copies of Government reports at the cost of reproduction and handling. For additional information and ordering instructions, see inside of front cover.



U. S. DEPARTMENT OF COMMERCE
BUSINESS AND DEFENSE SERVICES ADMINISTRATION
Office of Technical Services

U.S. GOVERNMENT RESEARCH REPORTS

U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

BUSINESS AND DEFENSE SERVICES ADMINISTRATION
Thomas E. Drumm, Jr., *Administrator*

Office of Technical Services
John C. Green, *Director*

Issued twice a month. Annual subscription $15 ($3.75 additional for foreign mailing). Single copy $1. Make remittance payable to Superintendent of Documents and mail either to a U.S. Department of Commerce Field Office or to Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Address changes should be sent to Superintendent of Documents.

Contents may be reprinted freely. Mention of source will be appreciated.

Use of funds for printing this publication approved by the Director of the Bureau of the Budget, June 30, 1961.

U.S. Government Research Reports

This publication is issued twice a month to announce new reports of research and development released by the Army, Navy, Air Force, Atomic Energy Commission, and other agencies of the Federal Government. Unless otherwise indicated, reports listed are available from the Office of Technical Services. Some are reproduced by photo-offset printing, others by photocopy reproduction.

The first section of *U.S. Government Research Reports* is compiled by the Armed Services Technical Information Agency and is called "Technical Abstract Bulletin." (ASTIA is a Department of Defense agency which services DOD agencies and their contractors with military research information.) The next section is called "Non-Military and Older Military Research Reports." Here are listed new reports of the Atomic Energy Commission, the Office of Saline Water of the Department of Interior, and reports of other civilian agencies of the Government. In addition, this section lists military research reports not to be found in the "TAB." Most of these older military reports have been acquired by OTS in response to specific industry requests.

How To Order Reports

Almost all reports listed in *U.S. Government Research Reports* are available from the Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C., or may be ordered through any Department of Commerce Field Office. Prices are given with each entry. Please use the identification numbers (AD number, PB number, AEC series number) and titles of reports when ordering. Prepayment is required. When any report is not available from OTS but from another source, the name and address of that source will be given. Direct your order to that address and not to OTS.

MICROFILM—Any reports available from the Office of Technical Services will be provided in microfilm (35 mm.) on request. The following prices are charged for microfilm: 1 through 20 pages, 80 cents minimum; and 3 cents per page for every page in excess of 20 pages.

TECHNICAL ABSTRACT BULLETIN

1. AIRCRAFT AND FLIGHT EQUIPMENT

AD-257 642 Div. 1, 9
(12 June 61) OTS price $6.60

Vertol Div., Boeing Airplane Co., Morton, Pa.
HIGH PERFORMANCE TANDEM HELICOPTER STUDY. VOLUME I. SUMMARY REPORT.
1 Apr 61, 1v. incl. illus. 12 refs. (Rept. no. R 233)
(Contract DA 44-177-tc-686)
(TREC TR 61-42) Unclassified report

DESCRIPTORS: *Helicopters, *Military aircraft, Design, *Aerodynamics, Load distribution, Stability, Tests, Temperature, Range, Helicopter rotors, Helicopter blades, Control, Airframes, Landing gear, Control systems, Fuselages, *Transport planes.

A preliminary design study was conducted to establish a tandem helicopter configuration capable of the following minimum performance: (1) 1600 nautical miles ferry range at zero headwind with 1 hour fuel reserve, (2) 200 mph speed with a minimum payload of 800 pounds, and (3) flying qualities to meet MIL-H-8501. Aerodynamic parametric studies and basic design layouts indicated that configurations derived from either the Boeing-Vertol 107 series or YHC-1B (Chinook) series could meet or exceed these performance requirements. Both blade radius and chord must be increased slightly, for either series, to insure that the ratio of payload to empty weight is maintained in going to the high performance configuration. Drag reduction and reduced blade loading were required to meet the range and speed requirements, but the installed power was not increased. It was concluded that either the advanced 107 or advanced YHC-1B were capable of the performance requirements and could be used to demonstrate the feasibility of high performance. (Author)

AD-257 681 Div. 1, 27
(14 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE MIRAGE IV AND STRIKING POWER,
by Jacques Gambu and Jean Perard. 15 Feb 61, 26p. incl. illus. (Trans. no. MCL-628 from Aviation Magazine 295:21-26, 15 Mar 60)
Unclassified report

DESCRIPTORS: France, *Airplanes, Atomic bombs, Turbojet engines, Triangular wings, Flight testing, *Jet bombers, Supersonic flight, Auxiliary power plants, *Supersonic planes, Aircraft cabins, Pressurized cabins, Aviation personnel, Strategic bombing, Bombers, Jet planes.

A supersonic bomber, the Mirage IV-A, is being developed to carry France's atomic bombs. The strategic needs for this aircraft, as well as its tactical uses are outlined. This delta-wing monoplane powered by twin Atar 9B turbojet engines was planned and developed from earlier models. The similarities and differences over the Mirage III-A are pointed out. Two special features are: (1) a new auxiliary power unit to provide the A. C. power supply for electronic equipment, and (2) a heat-insulated and air-conditioned cabin. Highlights of the flight testing programs through Mach 2 are discussed, and those men chiefly responsible for it are mentioned.

AD-257 701 Div. 1, 12
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THIS MAY INTEREST YOU.
13 Feb 61, 19p. incl. illus. (Trans. no. MCL-737 from Kridla Vlasti 8:12-13, 1960)
Unclassified report

DESCRIPTORS: *Aircraft, *Airplanes, *Czechoslovakia, *Germany, Satellite vehicles, Jet planes, Helicopters, Aircraft industry, France, Belgium.

Contents (periodical from Czechoslovakia):
The ornithopter (flapping wing aircraft) of Engineer Vogel of the German Democratic Republic (GDR)
Launching of the American satellite, Pioneer V
The first jet transport aircraft manufactured in the GDR
The Aeroflot aircraft IL-12 and -14
New version of the sports plane Piper Apache, designated the PA-23-250 Aztec
New GDR Pirna 014 turbojet engine
Aircraft market in the Middle East
Domestic airline transportation in GDR
One-rotor helicopter of Kaman in the U.S.A.
Service of the turboprop aircraft I1-18 Moskva
Aircraft industry of the GDR at the Leipzig Spring Fair
The CP-301 Emeraude of the French firm Piel Aviation, S.A.
The T-66 Tipsy-Nipper of the Belgian firm Avions Fairey S.A.

AD-257 714 Div. 1, 12
(16 June 61) OTS price $11.00

Air Force Flight Test Center, Edwards Air Force Base, Calif.
LIMITED PERFORMANCE, STABILITY AND CONTROL AND STRUCTURAL DEMONSTRATION TESTS OF A C-130B MODIFIED FOR SATELLITE RECOVERY,
by Charles O. Johnson, James L. Wendland, and Robert R. Heaton. Apr 61, 135p. incl. illus. tables (Rept. no. AFFTC TR 61-13)
Unclassified report

Division 1- AIRCRAFT AND FLIGHT EQUIPMENT

DESCRIPTORS: *Airplanes, *Transport planes, Tests, Flight testing, Stability (Lateral), Stability (Longitudinal), *Recovery, Direction finding, Antennas, Roll, Control systems, Stalling, Maneuverability, Airspeed, Flight speeds, Power, *Aerial pickup systems, Human engineering, Cockpits, Structures, Satellite vehicles, Re-entry vehicles, Space capsules.

The JC-130B is a C-130B aircraft modified to locate and recover re-entry satellites. Generally, the stability and control characteristics of the JC-130B are very similar to those of the C-130B within the normal cg envelope. Although several undesirable handling characteristics develop as the center of gravity is moved aft of the present 30 percent MAC aft cg limit, the cg envelope can be extended to 34.5 percent MAC. As compared to the C-130B, the JC-130B range is reduced by approximately 3.5 percent. Recommended cruise speeds remain unchanged; however, speeds for military and normal rated power are approximately 5 knots lower than for the C-130B. (Author)

AD-257 715 Div. 1
(15 June 61) OTS price $8.60

Air Force Flight Test Center, Edwards Air Force Base, Calif.
T-37B CATEGORY II PERFORMANCE TEST,
by Forrest W. Worthington and Emil Sturmthal. Apr 61, 89p. incl. illus. tables (Rept. no. AFFTC TR-61-16)
Unclassified report

DESCRIPTORS: *Jet planes, *Jet training planes, Training planes, Flight testing, Cockpits, Handling, *Turbojet engines, Take-off, Range, Airplane landings, Thrust, Calibration, Stalling, Stability, Control.

The performance of the T-37B is improved over that of the T-37A. Take-off performance, initial rate of climb, ceilings, and maximum level flight speeds have been increased significantly and add measurably to the mission capability of the aircraft. The increase in single engine performance is impressive and adds greatly to aircrew safety during the traffic pattern. The T-37B handling characteristics are generally satisfactory and are essentially identical to those of the T-37A. Nose wheel steering is much improved over steering on the T-37A. Ground handling control during normal and fast-cornering turns using nose wheel steering only is excellent. The only major deficiency noted in the T-37A report that is still present in the T-37B is the unsatisfactory braking system. (Author)

AD-257 835 Div. 1, 9
(16 June 61) OTS price $18.50

Wichita U. School of Engineering, Kans.
SHROUDED PROPELLER INVESTIGATIONS: TOTAL AND STATIC PRESSURE VARIATIONS ACROSS THE ANNULUS OF A SHROUDED PROPELLER MODEL,
by Vernon O. Hoehne. May 61, 288p. incl. illus. tables (Rept. no. 213-17)
(Contract Nonr-20101)
Unclassified report

DESCRIPTORS: *Shrouded propellers, Model tests, *Pressure, *Aerodynamics, Velocity, Wind tunnel models, *Propeller shrouds, Propeller blades, *Aerodynamic configurations, Lift, Drag, Torque, Strain gages, Digital computers, Tables, Variable pitch propellers, Tests, Guide vanes, Shroud rings.

Wind tunnel tests were conducted in which both total and static pressure surveys were made at six radial stations in the annulus of a shrouded propeller model. Pressure surveys were made both upstream and downstream of the plane of a 4-bladed and a 6-bladed variable pitch propeller. The model configuration consisted of a 0.50 chord/diameter ratio shroud which had provisions for changing the inlet configuration from a streamlined or high speed shape to a bellmouth shape and changing the exit configuration from a non-diffused to a diffused exit. The center-body of the model was constant at 30% of the shroud inner diameter. Pressure variations were recorded throughout a range of advance ratios from zero to 2.0 at three propeller pitch angles and model angles of attack from zero to 90 degrees. (Author)

AD-257 837 Div. 1
(16 June 61) OTS price $3.60

Flight and Engineering Test Group, Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
F-102 HIGH-ALTITUDE FLAMEOUTS IN AND AROUND THUNDERSTORMS,
by Philip I. Paul. Jan 61, 32p. incl. illus. tables.
(WADD TN 60-296)
Unclassified report

DESCRIPTORS: *Jet planes, *Jet engines, *Flight testing, High altitude, Storms, Thunderclouds, Hail, Ice, Ignition, Hazards, Jet engine inlets, Fouling, Stalling, Clouds, Gusts.

It was determined that mixtures of ice crystals and other precipitation commonly found in the core of thunderstorms at high altitudes constitute an extreme operating hazard to F-102 aircraft. The hazard can be relieved to a large extent by the installation and use of a continuous ignition system. It is recommended that the hard core or main precipitation area of the storm be avoided. (Author)

AD-257 882 Div. 1
(21 June 61) OTS price $4.60

Wichita U. School of Engineering, Kans.
ACHIEVING CONSISTENCY IN MAXIMUM PERFORMANCE STOL LANDINGS,
by A. J. Craig. Jan 61, 37p. incl. illus. table
(Engineering rept. no. 351)
(Contract DA 44-177-tc-356)
(TREC technical rept. no. 61-41)
Unclassified report

DESCRIPTORS: Landing, *Airplane landings, Tests, *Aerodynamics, Flight testing, Test methods, *Transport planes, Landing fields, Maneuverability, Instrumentation, Airplanes, Flight paths, *Short take-off planes, Pilots.

Factors influencing the achievement of minimum distance landings over a barrier were investigated to determine what might be done to provide consistency in landing in a computed minimum distance. It was found that the pilot regularly extracted the maximum aerodynamic performance of the airplane, but that limitations accompanying maximum aerodynamic performance prevented consistently short landings. The primary limitation was the inability to flatten or steepen the descent path during the approach to the barrier. (Author)

AD-257 896 Div. 1
(21 June 61) OTS price $10.50

Goodyear Aircraft Corp., Akron, Ohio.
STRESS ANALYSIS OF INFLATOPLANE MODEL GA-468.
18 Jan 61, 1v. incl. illus. tables (Rept. no. GER-9861)
(Contract Nonr-236800)
Unclassified report

DESCRIPTORS: *Reconnaissance planes, *Stresses, Load distribution, Mathematical analysis, Integral equations, Wings, Fuselages, Airplane engine mounts, Tails, Cockpits, Landing gear, Airframes.

Loads in the entire airframe (Government number YAO-3), including the wing, fuselage, engine mount, empennage, cockpit, and landing gear, are calculated and used to determine the stresses in these parts.

AD-257 988 Div. 1, 16
(20 June 61) OTS price $1.10

Fish and Wildlife Service, Washington, D. C.
BIRD HAZARD TO AIRCRAFT,
by John W. Aldrich, Chandler S. Robbins, and Walter W. Dykstra. Jan 61, 10p. incl. illus.
(Wildlife leaflet no. 429)
(Contract FAA/BRD-A-90)
Unclassified report

DESCRIPTORS: *Birds, Hazards, Aircraft, Countermeasures, *Aviation safety.

AD-257 989 Div. 1, 26, 30
(19 June 61) OTS price $4.60

National Aviation Facilities Experimental Center, Atlantic City, N. J.
DEVELOPMENT OF GENERAL SPECIFICATIONS FOR A DEVICE FOR INSPECTING HELICOPTER BLADE BONDING,
by Marion J. Arvin and Wayne D. Howell, Final rept. Nov 59, 15p. illus.
Unclassified report

DESCRIPTORS: Test methods, Helicopters, Helicopter rotors, *Helicopter blades, *Bonding, Test equipment, Specifications, Quality control, Nondestructive testing, Airplane panels, Adhesion, Sound transmission, Electronic equipment, Aluminum, Steel, Aluminum alloys, Sandwich panels, Honeycomb cores, Sandwich construction.

An experimental helicopter blade bonding inspection device was developed and tested on various representative samples of blade construction. The data accumulated from these tests provided a technical basis upon which the specifications were written for a portable field-type device to detect nonhomogeneity in helicopter blade bonding. (Author)

AD-257 991 Div. 1
(19 June 61) OTS price $17.50

Giravions Dorand Co. (France)
EXPERIMENTAL AND THEORETICAL STUDY OF LOCAL INDUCED VELOCITIES OVER A ROTOR DISK FOR ANALYTICAL EVALUATION OF THE PRIMARY LOADS ACTING ON HELICOPTER ROTOR BLADES.
15 Oct 60, 1v. incl. illus. tables, 15 refs.
(Rept. no. DE.2012)
(Contract DA 91-591-EUC-1165)
Unclassified report

DESCRIPTORS: Wind tunnel models, *Helicopter rotors, *Rotor blades, Tests, Test methods, Lift, Velocity, Drag, Mathematical anlaysis, Equations, Load distribution, *Helicopter blades, *Vortices, *Aerodynamics, Vision, Experimental data, Stability, Stresses, Control systems, Analysis, Smokes, Tables.

One of the main problems connected with the analytical evaluation of primary loads and transient control effects on helicopter rotors consists in the assumption of the local induced velocities over the rotor disk. Lack of knowledge of the actual vortex structure, which gives rise to the local blade induced velocities, explains the poor agreement between analytical and experimental results, mainly in blade stress problems and those connected with the transient effects in rotor control and stability studies. The solution of this problem by analytical methods alone leads to practically insoluble difficulties and for this reason an experimental method consisting in visualizing the vortices by smoke emission on model rotors, operated in a wind tunnel, was used to help to build-up a reasonable and intentionally simplified (for mathematical accessibility) canevas for the rotor vortex system. As a result of this study engineering methods are proposed for the analytical evaluation, with a satisfactory degree of approximation, of the local instantaneous induced velocities over a rotor disk, in various helicopter flight conditions, as a function of the rotor characteristics. (Author)

AD-257 992 Div. 1, 9
(19 June 61) OTS price $19.75

Giravions Dorand Co. (France).
DETERMINATION THROUGH WIND-TUNNEL TESTS AND ANALYTICAL METHODS OF THE OPTIMUM DEFLECTION DEVICES SUITABLE FOR USE ON JET-FLAP HELICOPTER ROTOR BLADES.
30 Dec 60, 1v. incl. illus. (Rept. no. DE.2013)
(Contract DA 91-591-EUC-1203)
Unclassified report

DESCRIPTORS: Wind tunnel models, *Jets, Deflection, *Flaps, Spoilers, *Helicopter blades, *Rotor blades, Helicopter rotors, Helicopters, Tests, Test methods, Lift, Boundary layer, Drag, *Aerodynamics, Mathematical analysis, Blade airfoils, Moments, Pneumatic devices, Control systems, France.

Tests of various jet-flap configurations were carried out in wind tunnels, with Mach numbers, blade pitch angles, jet deflections and C sub mu blowing coefficients approaching those encountered on helicopter blade rotors. Analysis of the test data showed that jet-flaps can be effectively used for control and propulsion of helicopter rotors, providing some precautions are taken concerning the compressed air characteristics and jet-flap design. The various types of deflectors tested were classified by order of efficacy, the pneumatic flap showing to be the best. This type of deflector provides universal possibilities and represents an instantaneous-response slaved control, devoid of play and

inertia, capable of reproducing multicyclic control patterns over the azimuth of the swept disk and making it possible to insure constancy of the air loads acting on the blades by creating suitably high lift on the retreating blade. The leading blade tip Mach number can be increased without fear of compressibility effects. (Author)

AD-258 002 Div. 1
(21 June 61) OTS price $1.10

Army Transportation Research and Engineering Command, Fort Eustis, Va.
AIRCRAFT MOORING EQUIPMENT,
by Robert M. Bernardin. Final rept. June 61, 101p. incl. illus. tables. (Technical rept. no. 61-12)
Unclassified report

DESCRIPTORS: Airplanes, *Military aircraft, Tests, Test methods, Wind, *Anchor plates, *Anchors, Mooring, Gusts, Arctic regions, Military requirements, Design, Army, Mathematical analysis, Attachment, Liaison planes, Helicopters, Cordage, Soils.

Research is reported on the testing and evaluation of devices and methods for mooring Army aircraft. Data pertaining to the ground-holding capabilities of a variety of anchors in various types of ground, a U. S. Army Arctic Test Board report on the testing of two anchors in frozen soil, and an engineering report on a proposed optimum mooring system are also covered. (Author)

AD-258 086 Div. 1
(19 June 61) OTS price $5.60

Vertol Div., Boeing Airplane Co., Morton, Pa.
FLIGHT EVALUATION OF REDESIGNED EXTERNAL CARGO SWING FOR H-21 HELICOPTER.
Jan 61, 53p. incl. illus. tables (Rept. no. R-232)
(Contract DA 44-177-tc-587, Proj. 9R89-02-015-14)
(TREC TR 61-33) Unclassified report

DESCRIPTORS: Cargo, Hoists, Design, Flight testing, Analysis, Mathematical analysis, *Helicopter hoists.

Flight test evaluation of a modified external cargo swing for H-21 helicopter is reported. Flight testing of cargo swing consisted of four flights in ground effect to evaluate swing extension and retraction, electrical and mechanical load release and load stability during flight maneuvers. It is concluded that the swing is now acceptable for potential retrofit on H-21 helicopters. (Author)

AD-258 215 Div. 1
(20 June 61) OTS price $1.10

Naval Air Test Center, Patuxent River, Md.
CARRIER SUITABILITY EVALUATION OF THE AIRCRAFT CAMERA POD, ASW TYPE LB-11A, ON THE S2F AIRCRAFT, Rept. no. 1 (Final) 5 June 61, 2p. table.
(Proj. RSSH-99/026; WEPTASK RA12 3P 000/201 1/F012 15 002)
Unclassified report

DESCRIPTORS: *Aircraft equipment, *Carrier landings, Cameras, Containers, Launching, *Camera mounts, Acceptability, Tests, Airplane protuberances.

AD-258 317 Div. 1, 27
(26 June 61) OTS price $8.10

Air Force Flight Test Center, Edwards Air Force Base, Calif.
AFSC T-33A PERFORMANCE EVALUATION,
by W. G. Schweikhard and Thomas P. Stafford.
May 61, 1v. incl. illus. tables (Rept. no. AFFTC TR 61-22)
Unclassified report

DESCRIPTORS: *Turbojet engines, *Tests, Jet planes, Military aircraft, Take-off, Landing, Flight testing, *Thrust, Cockpits, *Jet training planes, Airplane protuberances, Operation, Airplane engines, Calibration, Handbooks, Instrument panels.

Research is reported on the performance test of a representative T-33A aircraft with an average thrust engine to determine the cause for the variation in performance between aircraft. For comparison purposes additional tests were performed on an aircraft having a low thrust engine. With a few exceptions the test and Flight Manual performance data compare favorably for the representative aircraft tested. The greatest cause of thrust variation is not attributed to the deterioration of the engine with service life, but rather, to the broad thrust limits allowed after overhaul of the engine and to variations of trim rpm in flight. Low exhaust gas temperatures (below 685 degrees C) may indicate a low thrust engine; however, positive correlation of this point was not established. As a result of the qualitative investigation, it is recommended that the sideslip restrictions for the aircraft with travel pod installed be the same as for the aircraft with tip tanks installed. (Author)

2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-257 613 Div. 2
(14 June 61) OTS price $11.50

McGill U. (Canada).
THE TOPOGRAPHY AND BEHAVIOUR OF THE POLAR TROPOPAUSE OVER NORTH AMERICA DURING 1958,
by Charles W. Cook. Rept. on A Study of the North Polar Tropopause during 1958. Nov 60, 149p. incl. illus. tables (Arctic Meteorology Research Group Publication in Meteorology no. 31; Scientific rept. no. 7)
(Contract AF 19(604)3865)
(AFCRL TN 60-416) Unclassified report

DESCRIPTORS: *Atmosphere, *Stratosphere, *Air mass analysis, Climatic factors, Tables, Boundary layer, Meteorological charts, Temperature, North America, Arctic regions, Wind.

AD-257 650 Div. 2
(14 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
BULLETIN OF THE ALL-UNION ASTRONOMICAL GEOPHYSICAL SOCIETY (SELECTED ARTICLES).
27 Feb 61, 23p. incl. illus. tables (Trans. no. MCL-54 from Byulleten' Vsesoyuznogo Astronomo-Geodezicheskogo Obshchestva 15:pp. 10-19, 20-24, 1954)
Unclassified report

DESCRIPTORS: *Solar corona, *Brightness, Distribution, Determination, Solar eclipse, Sun, Statistical analysis, Earth, Atmosphere, Light, Reduction, *Solar spectrum, Galvanometers.

Contents:
An experiment in determining the distribution of the brightness on the solar disc from observations of a partial solar eclipse
Some peculiarity in the cyclic activities of the sun

AD-257 651 Div. 2, 25
(14 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
VARIABLE PROCESSES IN SOLAR FLARES AS A PHENOMENON OF PINCH-EFFECT,
by A. B. Severnyy. 27 Feb 61, 32p. incl. illus. table (Trans. no. MCL-82 from Paper read at Moscow Meeting in Aug 58, 18p.)
Unclassified report

DESCRIPTORS: *Solar flares, Solar spectrum, Solar atmosphere, Hydrogen, *Plasma physics, *Magnetic fields, Sunspots, Spectrographic analysis.

AD-257 662 Div. 2
(14 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE MOON AND ITS SURFACE (Luna I Yeye Poverkhnost')
by K. Portsevskiy. 24 Oct 60, 7p. incl. illus. (Trans. no. MCL-411 from Pravda Ukrainy 214:p.1, 15 Sep 59)
Unclassified report

DESCRIPTORS: *Moon, Surface properties, Extraterrestrial geography, Lunar probes, Orbital flight paths, Analysis, USSR.

AD-257 675 Div. 2, 25
(14 June 61) OTS price $5.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NEWS OF CRIMEA ASTROPHYSICAL OBSERVATORY (SELECTED ARTICLES).
2 Nov 60, 53p. incl. illus. tables. (Trans. no. MCL-487 from Izvestiya Krymskoy Astrofizicheskoy Observatorii 19:pp. 20-45; 126-139, 1958)
Unclassified report

DESCRIPTORS: *Astrophysics, *Magnetic fields, Energy, Absorption, Polarization, *Solar energy, Sunspots, Light, Iron, *Spectrographic analysis, Ionization, Electrons, *Ionosphere, Transformations (Mathematics), Solar spectrum, *Solar flares.

Contents:
On the theory of the formation of absorption lines in a magnetic field and the profile of FE 6173 angstroms in the solar sunspot spectrum
The behavior of the ionosphere during solar flares
Balance equation of ionization and its solutions
Experimental data

AD-257 676 Div. 2, 25
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONCERNING THE RELATIONSHIP BETWEEN SOLAR FLARES AND PHENOMENA IN THE LOWER IONOSPHERE (O Svyazi Mezhdu Solnechnymi Vspyshkami I Yavleniyami V Nizhney Ionosfere)
by N. N. Yeryushev and Yu. I. Neshpor. 2 Nov 60, 17p. incl. illus. tables. (Trans. no. MCL-488 from Izvestiya Krymskoy Astrofizicheskoy Observatorii 20:12-21, 1958).
Unclassified report

DESCRIPTORS: *Solar flares, *Ionospheric disturbances, Position finding, Solar corona, Diurnal variations, Brightness, Intensity, USSR, *Atmospherics, Radio communication systems, Ionosphere.

Contents:
Concerning the relationship between solar flares and phenomena in the lower ionosphere
Quantitative relationship
Concerning the relationship between the effectiveness of flares and their position on the solar disk
Concerning the relationship betwen the effectiveness of flares and the time of day

AD-257 702 Div. 2, 6
(14 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
RADIO ASTRONOMICAL OBSERVATIONS OF THE SECOND SOVIET INTERPLANETARY ROCKET,
by V. V. Vitkevich, A. D. Kuz'min and others. 13 Feb 61. 9p. (Trans. no. MCL-738 from Doklady Akademii Nauk SSSR 132:85-88, 1960)
Unclassified report

DESCRIPTORS: Space probes, USSR, *Radio astronomy, Moon, *Lunar probes, Radio signals, Tracking.

AD-257 773 Div. 2, 8, 30
(16 June 61) OTS price $2.60

Midwest Research Inst., Kansas City, Mo.
RESEARCH STUDIES RELATED TO MAPPING, GEODESY AND POSITION DETERMINATION,
by R. S. Brown, J. C. Gravitt, and others. Interim technical rept. no. 9, 19 Dec 60-18 Mar 61. 18 Mar 61, 24p.
(Contract DA 44-009-eng-3769, Proj. 8T35-12-001-01)
Unclassified report

DESCRIPTORS: *Mapping, *Geodesics, Position finding, Satellite vehicle trajectories, Errors, Mathematical computer data, Electromagnetic waves, Ionospheric propagation, Refractive index, Height finding.

The analysis discusses propagation of electromagnetic waves in an ionosphere with spatial variations of electron density, propagation of electromagnetic waves in the troposphere, corrective procedures in earth-surface geodetic measurements obtained with instruments utilizing wave-propagation principles, and a theory of the decay of refractive index fluctuations with height above the earth's surface. Since these areas of studies are in only the initial phases, no significant conclusions were reached concerning the problems of geodesy. (Author)

Division 2- ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-257 820 Div. 2
(16 June 61) OTS price $3.60

Stanford Electronics Labs., Stanford U., Calif.
STANFORD MICROWAVE SPECTROHELIOGRAMS FOR 1960 JUNE,
by G. Swarup. 28 Apr 61, 31p. incl. illus.
(Scientific rept. no. 11; Stanford Radio Astronomy Institute Publication no. 11)
(Contract AF 18(603)53)
(AFOSR-1600) Unclassified report

DESCRIPTORS: *Sun, Solar atmosphere, *Solar energy, Solar observatories, Solar flares, Spectrographic analysis, Mapping, Radio-frequency, Brightness, *Radio astronomy, Fluxmeters, Temperature, Measurement, Antennas, Radio interferometers.

By means of a microwave spectroheliograph, maps were made of the sun which show the disk distribution of solar radio emission at a wavelength of 9.1 cm by means of radioisophotes, or lines of constant brightness temperature. The contour interval, which varies from map to map, is usually about 80,000 K, and is determined after the map is drawn by reference to the measured flux density of the whole sun.

AD-257 821 Div. 2, 8
(16 June 61) OTS price $3.60

Stanford Electronics Labs., Stanford U., Calif.
PROPOSAL LEADING TO FUTURE LARGE RADIO TELESCOPES,
by R. N. Bracewell. 12 May 61, 31p. incl. illus.
(Scientific rept. no. 15; Stanford Radio Astronomy Institute Publication no. 14)
(Contract AF 18(603)53)
(AFOSR-1601) Unclassified report

DESCRIPTORS: *Radio astronomy, *Telescopes, Radio receivers, *Antennas, *Interferometers, Parabolic antennas, Reflectors, Sensitivity, Switching circuits, Antenna radiation patterns, Lobing, Transmission lines, Theory, Design, Multiple operation, Microwave frequency.

Investigations were concerned with the design of a radio telescope with a one-minute-of-arc beam. The feasibility of a one-minute-of-arc in one dimension was established. However, only a relatively small collecting area was used. To increase the area and to form a pencil beam, while keeping the structure close to the ground, one is led to consider echelon configurations. A multifocus arrangement of tiltable cylinders, stacked like the slats of a venetian blind was studied. The suppression of grating responses can be accomplished by a new tilt-independent technique in which a staggered pair of elements is switched against the remaining elements. The collecting area of a system in which some of the elements are switched, proves to be reasonable. Problems of interconnecting the tiltable elements so as to counteract the jump in path from one element to the next were partly met in achieving a one-minute fan beam. Multibeaming, a technique of halving observing time by doubling the investment in electronic equipment, is justified when the antenna cost is high and the beamwidth extremely narrow. (Author)

AD-257 826 Div. 2
(16 June 61) OTS price $11.50

Electronic Specialty Co., Los Angeles, Calif.
THE DYNAMIC MAPPING CONTRACT,
by Alan B. Lees, Richard H. Delano and others.
Technical rept. 24 Mar 61, 150p. incl. illus. tables.
(Contract AF 30(602)2243)
(RADC TR 61-83) Unclassified report

DESCRIPTORS: Solar system, Position finding, *Mapping, *Moon, Test methods, Geometry, Transformations (Mathematics), Lunar probes, *Geodetic data, Astronomical data.

This analysis was initiated to develop a target location and charting capability compatible with future weapon systems. Specifically, the problem of mapping in a dynamic earth-moon environment was investigated assuming the validity of Euclidean geometry and Newtonian mechanics as first approximations. Successful mapping in a dynamic environment is not the same as on the earth because there is no readily available reference surface such as the ellipsoids. As on the earth, though, a reference coordinate system and units of length are required. A discussion is conducted of the various reference systems that could be used. After analyzing possible coordinate systems, using the criteria of (1) Computational advantage; (2) Analytical advantage; (3) Data storage advantage; (4) Relation to basic observations, and (5) Conceptual advantage; it was determined that no specific coordinate system could be considered as the best for all dynamic mapping. When the units of distance are considered, many sources of error are present, but because of the rapid progress being made in determining such values as solar parallax, the errors will be reduced. (Author)

AD-257 831 Div. 2
(15 June 61) OTS price $9.60

Weather Bureau, Washington, D. C.
SOME FURTHER STUDIES ON THE METEOROLOGY OF THE GREENLAND AREA,
by P. Putnins, V. J. Creasi, and H. E. Rosendal.
Final rept. 1 Nov 60-31 Jan 61. Mar 61, 110p. incl. illus.
(Sponsored by U. S. Army Signal Research and Development Laboratory, Fort Monmouth, N. J.)
Unclassified report

DESCRIPTORS: *Atmosphere, *Stratosphere, *Air mass analysis, Barometric pressure, Temperature, High altitude, Surface properties, Meteorological charts, Climatic factors, Greenland, Arctic regions, Tables, Meteorology.

Contents:
Correlation between pressure changes aloft and at the surface in the Greenland area, and some aspects of the steering problem
An analysis of an extreme case of air mass change over the Greenland ice cap
Correlation between some upper air elements at the ice cap and Greenland coastal stations
A case of cyclogenesis at the west coast of Greenland, March 15-16, 1950

AD-257 841 Div. 2, 4
(20 June 61) OTS price $23.50

Air Force Cambridge Research Labs., Bedford, Mass.
THE CHEMISTRY AND VERTICAL DISTRIBUTION OF ATOMIC NITROGEN IN THE UPPPER ATMOSPHERE,
by Lewis E. Miller. Dec 60, 466p. incl. illus. tables, 441 refs. (AFCRL TR 60-280)
Unclassified report

DESCRIPTORS: *Upper atmosphere, *Nitrogen, Atoms, Chemistry, *Free radicals, Chemical reactions, Recombination reactions, Night sky, Dissociation, Absorption, *Bibliography, Theory, Aurorae, Atmosphere models,

Measurement, Spectrographic analysis, Ultraviolet radiation, Molecules, Atmosphere.

An intensive and extensive review and analysis is summarized and given in tabular form. This is based on some 540 papers covering various aspects of the discovery of active N in the laboratory and the identification of atomic N in auroral and night airglow spectra. An integral part of the existence of atomic N in the upper atmosphere is the absorption of UV radiation by molecular N. Such topics as absorption coefficients, dissociation energy of molecular N, discovery of the negative bands of N2(+), and the various band systems of N are included. More recently there has been an acute emphasis on the rates of free radical reactions and recombination coefficients. So far as is possible these data have been presented within the various summaries. The author and subject indices should aid in making this treatise a valuable and informative reference source. (Author)

AD-257 842 Div. 2
(20 June 61) OTS price $9.60

Geophysics Corp. of America, Bedford, Mass.
ATMOSPHERIC TURBULENCE,
by R. J. Papa. Apr 61, 110p. incl. illus. tables. (GCA technical rept. no. 61-22-A; Scientific rept. no. 7)
(Contract AF 19(604)7405)
(AFCRL-306) Unclassified report

DESCRIPTORS: *Atmosphere, Upper atmosphere, *Turbulence, Turbulent flow, Statistical analysis, Physical properties, Mechanical properties, Radio waves, Scattering, Condensation trails, *Diffusion, Meteorology, Wind.

Contents:
Origin and characteristics of turbulence
  Nature of turbulent flow
  Criteria for onset of turbulence
Mathematical basis of turbulence
  Reynolds stresses
  The mixing length
  Statistical theory of turbulence
  Instabilities and mathematical criteria for onset of turbulence
Turbulent diffusion close to the earth's surface
  The K theory
  Statistical theories
Turbulence in the upper atmosphere
  Possible mechanisms for generation of turbulence in the upper atmosphere
  Observations of meteor trains
  Sodium vapor trails
  Radio scattering due to atmospheric turbulence

AD-257 885 Div. 2
(21 June 61) OTS price $2.60

Chicago U., Ill.
ON THE MESOMETEOROLOGICAL FIELD STUDIES NEAR FLAGSTAFF, ARIZONA,
by Tetsuya Fujita, Kenneth A. Styber, and Rodger A. Brown. May 61, 13p. illus. table (Scientific rept. no. 1)
(Contract AF 19(604)7259)
(AFCRL-492) Unclassified report

DESCRIPTORS: Meteorology, *Mountains, *Precipitation, Wind, *Micrometeorology, Microbarometers, Meteorological charts, Thunderclouds, Arizona.

During the month of July 1960, a mesometeorological field network was established in an area of 30 x 40 mi centered around San Francisco Mountain, Arizona. Network instrumentation included 33 microbarographs, 10 hygrothermographs, 10 Beckman-Whitley wind recorders, about 165 nonrecording rain gauges, and 165 hail gauges. Daily precipitation amounts were carefully studied in order to relate them with the characteristics of moisture inflow into the network area. An analysis of the July 22 case over the network area revealed that a very small low-pressure area formed over the heated side of the mountain slope, providing a field of convergence leading to the morning cumulus convection. As time went on, this low dissipated and cumulonimbus convection occurred. The mesometeorological network was found to be most suitable for the investigation of cumulus to cumulonimbus convection over the San Francisco Mountain area. (Author)

AD-257 888 Div. 2, 25
(21 June 61) OTS price $16.00

Woods Hole Oceanographic Institution, Mass.
THE ELECTRIFICATION OF THE ATMOSPHERE BY PARTICLES FROM BUBBLES IN THE SEA,
by Duncan C. Blanchard. Doctoral thesis. Apr 61, 244p. incl. illus. tables (Ref. no. 61-9)
(Contract Nonr-79800, Proj. NR 082-124)
Unclassified report

DESCRIPTORS: *Atmospheric electricity, Particles, *Oceans, Surface properties, Electric discharges, *Bubbles, Climatic factors, Sources, Separation, Oceanographic data.

Work was directed towards an evaluation of the quantity of electric charge that is separated at the surface of the sea. As the carriers of the charge are particles that arise from the sea by wind and wave action, it was necessary to determine first the flux of particles across the sea and the manner in which the particles originated. Then, laboratory studies were carried out to determine the sign and magnitude of the particle charge. The data from these two separate investigations were combined to obtain an estimate of the charge separation by the world ocean. Results indicate that a majority of the particles that arise from the sea evolve from bubbles that break at the sea surface. These particles come from both the bubble film and the breakdown of a jet which rises at high speeds from the bottom of the collapsing bubble cavity. The film drop flux was computed directly from a knowledge of the world ocean whitecap coverage. The flux of jet drops, on the other hand, was computed indirectly, first by assuming a steady state between the source and the sink of the jet drops and then by computing their fall-out rate by sedimentation, rain washout, and advection over the continents. (Author)

AD-257 905 Div. 2
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div. Washington, D. C.
THE TUNGUSKA METEORITE.
3 May 61, 2p. (AID rept. 61-58, Trans. from Preliminary Results of the Work of the Tunguska Meteorite Expedition in 1958; Akademiya Nauk SSSR. Komitet Po Meteoritam, Meteoritika 19:103-134, 1960 and New Data on the Tunguska Catastrophe of 1908; Akademiya Nauk SSSR, Doklady 136:84-87, 1 Jan 61)
Unclassified report

DESCRIPTORS: *Meteorites, *Earth, Landing impact, Geological survey, Shock waves, Pressure, USSR, *Impact shock, Trees.

Division 2-ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-257 913 Div. 2
(22 June 61) OTS price $3.60

Science and Tech. Section, Air Information Div. Washington, D. C.
PHENOMENA IN THE UPPER ATMOSPHERE. REVIEW OF SOVIET LITERATURE.
Monthly rept. no. 13 for May 61, 31 May 61, 35p. incl. illus. tables (AID rept. 61-69)
Unclassified report

DESCRIPTORS: *Geophipics, *Solar energy, Ionosphere, Attenuation, Sea water, Van Allen radiation belt, Cosmic rays, Earth, *Terrestrial magnetism, Atmospheric electricity, Lightning, Shock waves, Satellite vehicles, Guided missiles, Literature, *USSR, *Upper atmosphere.

Materials in this analysis deal with the following topics: (1) Solar radiation and the ionosphere, (2) Van Allen belts and cosmic rays, (3) Telluric currents, (4) Atmospheric electricity, and (5) Satellite and missile data. (Author)

AD-257 936 Div. 2, 5, 25
(21 June 61) OTS price $3.60

Rand Corp., Santa Monica, Calif.
D-LAYER IONIZATION LOSS RATES,
by C. M. Crain. 14 Apr 61. 39p. incl. illus.
(Research memo. no. RM-2740)
(Contract AF49(638)700, Proj. Rand)
Unclassified report

DESCRIPTORS: *Upper atmosphere, *Electrons, Intensity, *Ionization, Density, Oxygen, Water vapor, Absorption, *Radio communication systems, Solar eclipse, Cosmic rays, *Ionosphere, Ionospheric disturbances.

Certain ionization phenomena are examined in the region of the earth's atmosphere from about 50 to 90 kilometers, the D-layer. The concentration of electrons in this region tends to change with the incidence of solar radiation, being greatest in the daytime and falling off during the nighttime or during solar eclipses. Factors in this process are rates of attachment and detachment of electrons to molecules of oxygen (and possibly water vapor) and recombination rates of ions and electrons. The ionization effects attributable to cosmic radiation are also examined. As a study in the basic physics of the upper atmosphere, this analysis provides part of the background for investigations of the effects of high-altitude nuclear explosions on radio communications. It is thus tied in with research leading to improved methods of post-attack command and control. (Author)

AD-257 982 Div. 2, 25
(19 June 61) OTS price $2.60

Research Inst. of Science and Engineering, U. of Detroit, Mich.
GRAVITATIONAL RADIATION IN FLAT SPACETIME RELATIVITY,
by James C. Keith. Interim rept. no. 1g.
8 Feb 61, 25p. illus.
(Contract DA 44-177-tc-519)
Unclassified report

DESCRIPTORS: *Gravity, *Time, Theory, Velocity, Relativity theory, Mass energy relation.

The possibility of a 1/c to the 3rd power order gravitational radiation is considered within the framework of the flat spacetime relativistic gravitational theory. The method stresses the complementarity between results derived by considering direct interparticle actions and the intensity of the far gravitational radiation field. It is proved that centrifugal as well as gravitational forces may dampen the accelerated motion of a system of masses. The results predict that a freely rotating mass system will dissipate energy at a rate directly proportional to its total energy and to the factor $-k(aw/c)$ to the 3rd power 1/sec, w being the angular velocity, a the radius of rotation, c the velocity of light in vacuo, and k a dimensionless ratio of the system's moments. For a small rotor magnetically suspended and spun in ultrahigh vacuum, the gravitational power loss can be detected directly by measuring the angular deceleration. An experimental decision should help shed light on the validity of the more generally accepted 1/c to the 5th power order radiation predicted by other means. (Author)

AD-258 047 Div. 2
(20 June 61) OTS price $1.60

Free U., Berlin (Germany).
WIND AND DENSITY DISTRIBUTION IN THE FREE ATMOSPHERE,
by Johannes Clauss. Final technical rept. 15 May 60-15 May 61. 15 May 61, 8p. incl. illus. tables.
(Contract DA 91-591-EUC-1461, Proj. 01-4585-60)
Unclassified report

DESCRIPTORS: *Wind, *Upper atmosphere, Recording systems, *Data processing systems, Punched card methods, Data transmission systems, Meteorological data, Europe.

This analysis gives a detailed description of sources, working techniques and other methods that were used for the treatment of aerological raw data needed for establishing a climatology of the free atmosphere over central and eastern Europe. Ways are shown to provide for the electronic input to be as faultless as possible. (Author)

AD-258 049 Div. 2, 6, 30
(10 June 61) OTS price $1.60

Illinois State Water Survey, Urbana.
STUDY ON INTENSITY OF SURFACE PRECIPITATION USING RADAR INSTRUMENTATION,
by E. A. Mueller and G. E. Stout. Quarterly technical rept. no. 12, 1 Jan-31 Mar 61. 31 Mar 61, 11p. incl. illus.
(Contract DA 36-039-sc-75055)
Unclassified report

DESCRIPTORS: *Meteorological radar, *Precipitation, Intensity, Measurement, Raindrops, Recording devices, Instrumentation, Radioactive fall-out, Effectiveness, Cameras, Photographic analysis.

Data film was obtained from both of the new raindrop camera installations located in New Jersey and North Carolina. The transmissometer was installed in New Jersey and the first roll of data from this instrument obtained. The Indonesia installation produced 27 rolls of film. Data reduction is proceeding normally with a total of 14 rolls of film measured. An attempt to classify the drop size distribution according to the instability obtained from the upper air soundings was initiated. (Author)

AD-258 074 Div. 2
(21 June 61) OTS price $1.10

American Meteorological Society, Boston, Mass.
INSTRUMENTS AND METHODS FOR INVESTIGATING ATMOSPHERIC ELECTRICITY (Pribory I Metody Dlia Izucheniia Elektrichestva Atmosfery)
by I. M. Imianitov. Apr 61, 3p. (Trans. no. M-RTC-29 from Gostekhizdat, published in Moscow: 484p., 1957)
(Contract AF 19(604)6113)
Unclassified report

DESCRIPTORS: *Atmospheric electricity, *Electrical properties, Lightning, Thunderclouds, Measurement, Recording devices, USSR, Ionization, Electrometers.

AD-258 085 Div. 2, 9
(22 June 61) OTS price $8.10

Johns Hopkins U. School of Engineering, Baltimore, Md.
RESEARCH IN GEOPHYSICAL FLUID DYNAMICS,
by George S. Benton. Final rept. vol. 1. May 61, 80p. incl. illus. tables.
(Contract AF 19(604)2056, continuation of Contract AF 19(604)916)
(AFCRL-616) Unclassified report

DESCRIPTORS: Geophysics, *Fluid flow, *Atmosphere, Vortices, Differential equations, Harmonic analysis, *Jet streams (Meteorology), Upper atmosphere, Wave characteristics, Perturbation theory.

This report includes:
STEADY STATE TWO DIMENSIONAL-FLOW WITH AN EXPONENTIAL VORTICITY DISTRIBUTION, by George S. Benton. May 61, 28p. incl. illus.

STABILITY OF THE JET STREAM, by Frank B. Lipps. May 61, 33p. incl. illus. tables.

AD-258 122 Div. 2
(27 June 61) OTS price $6.60

Electrical Engineering Research Lab., U. of Texas, Austin.
RESEARCH IN TROPICAL METEOROLOGY,
by Wilfried H. Portig, Virgil C. Kowalik, and John R. Gerhardt. Quarterly technical rept. no. 3, 1 Jan-31 Mar 61. 31 Mar 61, 1v. incl. illus. tables.
(Contract DA 36-039-sc-84937, Proj. 3A99-07-001-08)
Unclassified report

DESCRIPTORS: *Meteorology, Tropical regions, *Protective clothing, Protective coverings, Head, Africa, Meteorological data, Meteorological charts, *Cyclones, Caribbean Sea, Helmets.

A preliminary study of meteorological conditions which necessitate protection of the head is reported. The use of the Tropical Helmet is a matter of concern in many areas and this analysis attempts to show the possibility of a more substantial attack on the problem. Radiational gains of a standing human are compared to that of an upright cylindrical solid. Difficulties and limitations are presented and suggestions for a more thorough investigation are enumerated. Certain small lows are classified as whirls and a pilot study of the period 4-13 May 1959 is reported. Descriptions of the formation, life, dissipation and effects of these whirls are given. Although the major investigation was of the upper air levels the effects of these whirls on the surface conditions are reported. Further research activities along this line are suggested. (Author)

AD-258 134 Div. 2, 25
(19 June 61) OTS price $5.60

Minnesota U. School of Physics, Minneapolis.
ANALYSIS OF BALLOON OBSERVATIONS DURING THE APRIL 1960 SOLAR COSMIC RAY EVENTS,
by Andrew J. Masley. Apr 61, 54p. incl. illus. tables. (Technical rept. no. CR-35)
(Sponsored by the Office of Naval Research)
Unclassified report

DESCRIPTORS: *Cosmic ray bursts, High altitude, Recording devices, Measurement, *Ionization chambers, *Meteorological balloons, *Magnetic storms, Intensity, X-rays, Radioactivity, Detectors, Particles.

AD-258 258 Div. 2
(19 June 61) OTS price $7.60

Melpar, Inc., Watertown, Mass.
ANALYSIS OF MESOSCALE STRUCTURE IN ANTICYCLONIC JET-STREAM FLOW,
by Paul F. Twitchell. Final rept. on Meteorological Research Investigation. 30 Apr 61, 1v. incl. illus. tables.
(Contract AF 19(604)6122)
(AFCRL-493) Unclassified report

DESCRIPTORS: *Jet streams (Meteorology), *Anticyclones, Wind, Cross circulation, Upper atmosphere, Meteorological charts, Measurement, Recording devices, Aircraft, Flight, *Velocity.

This analysis was conducted to gain scientific knowledge about certain atmospheric phenomena associated with the jet stream and to present the findings in a manner which will encourage further research. Data obtained primarily from four Project Jet Stream aircraft flights in upper-air ridges located over northeastern United States were evaluated. Ridge jet-stream characteristics are illustrated and discussed; and a composite cross section of the four flights is presented. Wind measurements made by the aircraft are compared with geostrophic and gradient winds computed from upper-air charts and the geostrophic and gradient wind departures so determined are presented. Gradient winds were found better than the geostrophic as an approximation to observed winds in the vicinity of an anticyclonic jet stream. The statistical significance of the departures is discussed. Conclusions and recommendations include suggestions for further development of categorizing turbulence with specific atmospheric conditions. Also recommended is the application of objective statistical techniques for forecasting the probability of turbulence occurrences under given conditions. (Author)

Division 3 - CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-258 260 Div. 2, 25
(19 June 61) OTS price $2.60

Marine Physical Lab., U. of Calif., San Diego.
DEEP ANOMALIES IN ELECTRICAL CONDUCTIVITY,
by Ulrich Schmucker. Annual progress rept. for July 59-July 60. 1 July 60, 22p. incl. illus. table. (SIO ref. no. 61-13)
(NSF Grant no. 6286)
Unclassified report

DESCRIPTORS: Geophysics, *Terrestrial magnetism, *Earth, Electricity, Electric fields, Magnetic fields, Texas, New Mexico, Colorado, Utah, Arizona, Nevada, California, *Electrical conductance, Magnetometers.

Local differences of the geomagnetic variations in the southwestern United States are studied by means of a closely spaced net of temporary geomagnetic observatories in this area. (Author)

AD-258 269 Div. 2
(22 June 61) OTS price $23.50

1st Weather Wing, Air Force.
U.S. - ASIAN MILITARY WEATHER SYMPOSIUM HELD AT JOHN HAY AIR BASE, BAGUIO, PHILIPPINE ISLANDS, 13-17 FEBRUARY 1961.
1961, 1v. incl. illus. tables.
Unclassified report

DESCRIPTORS: *Meteorology, Weather forecasting, Meteorological data, Military training, *Symposia.

AD-258 308 Div. 2
(26 June 61) OTS price $2.60

Beach Erosion Board, Corps of Engineers, Washington, D. C.
DISCUSSION OF TECHNICAL MEMORANDUM NO. 120. THE PREDICTION OF HURRICANE STORM-TIDES IN NEW YORK BAY (AND CLOSURE BY AUTHOR),
by Basil W. Wilson and D. Lee Harris. Apr 61, 29p. incl. tables. (Technical memo. no. 120-A)
Unclassified report

DESCRIPTORS: New York, Geography, *Hurricanes, Storms, Mathematical prediction, Tides, Weather forecasting.

AD-258 346 Div. 2
(22 June 61) OTS price $1.60

Massachusetts Inst. of Tech., Cambridge.
RESEARCH DIRECTED TOWARD STUDY OF ATMOSPHERIC REACTIONS TO CHANGING CONDITIONS OF SOLAR ACTIVITY,
by Hurd C. Willett. Final rept. 1 Apr 61, 10p.
(Contract AF 19(604)3056)
(AFCRL-487)
Unclassified report

DESCRIPTORS: Solar flares, *Sunspots, *Magnetic storms, Climatic factors, *Weather forecasting, Northern hemisphere, Statistical analysis, Aurorae.

Solar-weather relationships were investigated to establish any consistent pattern of short-term reaction of the general circulation to specific sudden solar disturbance. Three major progressive steps are required: (1) The critical analysis of available indices of short-term solar disturbance in the effort to establish criteria of sudden solar activity for the selection of key days of solar outburst of specific character, (2) The detailed specification by selected index parameters of the significant features of the general circulation of the northern hemisphere for each of the selected key days, followed in turn by the corresponding specification of the changing features of the general circulation for an arbitrary number of days preceding and following each key day, and (3) The analysis of the day to day change of significant features of the general circulation from the days preceding through the days following all key days of solar activity that are selected for similarity of the solar disturbance and similarity of the initial state of the general circulation on the key day. (Author)

3. CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-257 605 Div. 3, 30
(14 June 61) OTS price $11.50

Douglas Aircraft Co., Santa Monica, Calif.
BW/RWS - MODEL DA-88.
Suppl. to final rept. on phase 1. Jan-Mar 61. 30 Apr 61, 147p. incl. illus. tables (Rept. no. SM-38595, Suppl. to AD-255 589)
(Contract DA 18-064-cml-2746)
Unclassified report

DESCRIPTORS: Pyrolysis, Biological warfare, *Biological warfare agents, Air, Sampling, *Detection, Effectiveness, *Instrumentation, Model tests, Tests, Aerosols, Biochemical tests, Particles, Biological laboratories, Proteins, *Toxic agent alarms, Analysis, Data processing systems, Bacterial aerosols, Bacteria, Viability, Atmosphere.

This report is a supplement to the Final Report on Phase I of the Biological Warfare/Rapid Warning System program, covering the period January through March, 1961. The work was performed under an extension to the U. S. Army Chemical Corps prime Contract No. DA-18-064-cml-2746. The scope of work in this period consisted basically of adding an improved air dilution system to both Mobile Laboratories, installing a Canadian pyrolyzer in one Laboratory, and deploying these Laboratories to obtain more air sampling data. These data were then analyzed to estimate the probable effectiveness of the several types of detection instruments in a warning system. (Author)

AD-257 629 Div. 3, 10, 27
(14 June 61) OTS price $1.60

Reaction Motors Div., Thiokol Chemical Corp., Denville, N. J.
PRESSURIZATION-THRUST RELATIONSHIPS OF VISCOELASTIC FLUIDS,
by B. Dawson, D. Schmidt, and A. Corbett. Quarterly rept. no. 3, 9 Feb-9 May 61. 9 May 61, 18p. incl. illus. (Rept. no. 2068-Q3)
(Contract DA 18-108-405-cml-851)
Unclassified report

DESCRIPTORS: *Flame throwers, Propellants, Rocket motors, Liquid rocket propellants, Rocket oxidizers, Hydrazines, Rocket fuels, Methyl hydrazines, Nitrogen compounds, De-

sign, Tetroxides, *Recoil mechanisms, Gases, Thrust, Control systems, Combustion chamber gases, Gas generating systems, Pressure, Instrumentation.

A study was made of the utilization of a bipropellant thrust chamber for recoil compensation in a portable flamethrower. There are presented preliminary design studies of a small bipropellant rocket using the propellant combination of unsymmetrical dimethyl-hydrazine and nitrogen tetroxide. Also presented are system schematics suitable for use in modifying the test apparatus at the Army Chemical Center in order to permit demonstration of the feasibility of this concept. System response requirements are discussed in terminology appropriate to rocket systems. Typical transient characteristics of rockets suitable for this application are described. Methods for controlling the operation of various parts of the flamethrower and the rocket are discussed. Finally, instrumentation requirements for the test apparatus are examined. (Author)

AD-258 146 Div. 3, 4
(20 June 61) OTS price $8.10

New York U., N. Y.
NEW PRINCIPLES FOR TOXIC AGENT ALARMS,
by Robert T. Morrison and Seymour Z. Lewin. Final rept. for 1 Oct 59-31 Jan 61. 31 May 61, 87p. incl. tables.
(Contract Da 18-108-405-cml-575)
Unclassified report

DESCRIPTORS: *Toxic agent alarms, Theory, Catalysis, Phosphorus compounds, Chemical properties, Chemical reactions, Chemical warfare agents, Detection, Hydrolysis, Amines, Hydroxamic acids, Sensitivity, Electrochemistry, Electronic equipment, Detectors, Gas detectors.

CATALYSIS OF NUCLEOPHILIC CLEAVAGE OF PHOSPHONATES: So that a large number of catalysts and catalyst combinations could be studied rapidly and exactly, hydrolysis of a simple compound such as diethyl methylphosphonate was followed. Results indicated that neither catalysis by acids or bases were readily observable for this reaction, where the attacking nucleophile is a hydroxide ion. REARRANGEMENT OF HYDROXAMIC ACIDS: p-(Phenylazo)-benzohydroxamic acid was prepared from the commercially available acid chloride, p-C6H5-N:N-C6H4-COCl. Unsuccessful attempts were made to prepare p-(p-nitrophenylazo)benzohydroxamic acid. A STUDY OF THE PRACTICAL SENSITIVITY LIMITS OF CERTAIN TRACE DETECTION TECHNIQUES: A survey was made of existing electrochemical and electronic detection techniques. Coulometry in moderate volumes of solution and direct gas phase ionization current measurement appear to be superior techniques.

AD-258 336 Div. 3
(22 June 61) OTS price $4.60

Dugway Proving Ground, Utah.
ENVIRONMENTAL TEST OF KIT, DETECTOR, CHEMICAL AGENT, M9A2.
May 61, 43p. incl. illus. tables (Technical rept. no. DPGR 280)
Unclassified report

DESCRIPTORS: *Toxic agent alarms, *Gas detectors, Detection, Colorimetry, Chemical warfare agents, Storage, Arctic regions, Desert tests, Effectiveness, Detectors, Tests, Tropical regions, Climatic factors.

The effects were investigated of environment upon the storage and operation of the M9A2 kit in the climates represented by the arctic, desert, temperate, and tropic test sites. The M9A2 kit, over the approximate 48-month test period, satisfactorily identified the following toxic chemical agents: distilled mustard (HD), nitrogen mustard (HN), ethyldichloroarsine (ED), hydrogen cyanide (AC), phosgene CG), cyanogen chloride (CK) and G-agent (GB). Over-all, the M9A2 kit performed satisfactorily after approximately 48 months of storage. Conclusions regarding the component parts of the M9A2 kit are: (1) the tests for lewisite are not adequate at the tropic site; (2) the brown dot tubes show a high degree of deterioration at each of the test sites; and (3) the markings made by the M7A1 vesicant detector crayons are affected by sunlight at the Desert Site. The crayons show a high degree of crumbliness. (Author)

4. CHEMISTRY

AD-257 684 Div. 4, 20
(14 June 61) OTS price $8.10

Aerospace Technical Intelligence Center. Wright-Patterson Air Force Base, Ohio.
CHEMICAL INDUSTRY (SELECTED ARTICLES).
Feb 61, 79p. incl. illus. (Trans. no. MCL-664 from Khimicheskaya Promyshlennost' 8:pp 647-652; 672-674; 721-738, 1959)
Unclassified report

DESCRIPTORS: *Radiochemistry, Atomic energy engineering, Economics, Costs, Production, *Industrial production, *Chemical engineering, *Ethylenes, Polymers, Polymerization, *Styrenes, Expanded plastics, Manufacturing methods, Bibliography, Indexes, USSR, Gamma rays, Chemical reactions, Radiation damage, Decomposition.

Contents:
Basic technological characteristics of apparata for conducting radio-chemical processes (in particular, for polymerization of ethylene) on an industrial scale, by N. P. Syrkus, A. Kh. Breger and B. I. Vaynshteyn
Production of foamy polystyrene with the aid of saturated low-boiling hydrocarbons, by V. M. Nepyshnevskiy and G. M. Sinayskiy
Index of articles published in the journal, Khimicheskaya Promyshlennost' during 1959
Author Index
Subject Index

AD-257 698 Div. 4
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NEW POLYMERS OF THE CATALYTIC POLYMERIZATION OF ORGANOSILOXANES,
by K. A. Andrianov, S. I. Dzhenchel'skaya, and Ju. K. Petrashko. 13 Feb 61, 13p. incl. illus. tables (Trans. no. MCL-729 from Plasticheskiye Massy 3:20-23, 1960)
Unclassified report

DESCRIPTORS: *Polymerization, *Polymers, *Silicones, Organic compounds, Methyl radicals, Ethyl radicals, Phenyl radicals, Sulfuric acid, *Silanes, Catalysis, Catalysts, Chemical reactions, Silicon compounds, Polycyclic compounds, Hydrolysis, Copolymerization, Films, Stability, Mechanical properties, Physical properties, USSR, High temperature research.

A study has been made of the process of catalytic polymerization of cyclic products containing phenyl-, phenylmethyl-siloxane groups, and phenyl-, phenylmethyl-, and dimethylsiloxane groups at 120 degrees, and ethylsulfuric acid as a catalyzer. It was established that in the cohydrolysis of phenyltrichlorsilane with phenylmethyldichlorsilane, or the same products with dimethyldichlorsilane, cycles are formed which polymerize partially under the effect of an acid catalyzer at high temperatures. During the process of polymerization, a partial breaking off of the phenyl groups takes place simultaneously, accompanied by the formation of polymers of branched structure and low molecular weight. (Author)

AD-257 747 Div. 4, 12, 14, 25
(16 June 61) OTS price $2.25

General Electric Co., Cincinnati, Ohio.
CARBONIZATION OF PLASTICS AND REFRACTORY MATERIALS RESEARCH. PART I,
by J. A. Coffman, G. M. Kibler and others. Rept. for 1 Nov 59-30 June 60 on Material Thermal Properties. Feb 61, 89p. incl. illus. tables.
(Contract AF 33(616)6841, Proj. 4776)
(WADD TR 60-646, pt. 1) Unclassified report

DESCRIPTORS: Heat transfer, *Plastics, Resins, Phenolic resins, Epoxy resins, Polymers, *Heat resistant polymers, *Carbonization, *Pyrolysis, *Refractory materials, *Carbides, Tantalum compounds, Tungsten, Thorium compounds, Zirconium compounds, Nickel, Photoemission, Vaporization, Vapor pressure, High temperature research, Thermochemistry, Decomposition, Spectrographic analysis, Mass spectroscopy, Ablation, Guided missiles.

Details are presented of experimental investigations concerned with (1) the rate and mechanism of the carbonization of plastics; (2) the measurement of the vapor pressure of refractory materials; and (3) the determination of the spectral emissivities of refractory materials. Three complementary experimental techniques were used to study the carbonization of plastics: (1) thermogravimetric analysis, which given an over-all picture of reaction rates under slow heating; (2) fluid-bed carbonization of powdered resin, which provides insight into the mechanism; and (3) arc image furnace experiments in which the plastics are exposed to temperatures approaching those of actual ablation applications. Vapor pressure studies were conducted using the Langmuir evaporation technique. In addition matrix-isolation techniques and resonance-line absorption spectroscopy were applied to the study of vapor species. Materials studied were TaC, ZrC and ThO2. Normal spectral emissivities of W, TaC and ZrC have been measured between 1800 and 3000 K using an emissometer. (Author)

AD-257 863 Div. 4, 21, 25
(21 June 61) OTS price $5.60

AeroChem Research Labs., Inc., Princeton, N. J.
PROPERTIES OF EQUILIBRIUM DISSOCIATING HYDROGEN FOR PREDICTING CONVECTIVE HEATING IN NUCLEAR THERMAL ROCKETS,
by Daniel E. Rosner. Feb 61, 1v. incl. illus. tables, 23 refs. (Technical pub. no. 27)
(Contract Nonr-277300) Unclassified report

DESCRIPTORS: *Hydrogen, Thermal radiation, *Dissociation, Chemical equilibrium, Heating, Nuclear propulsion, Rocket motors, Rocket motor nozzles, Cooling, *Heat transfer, Convection, Thermodynamics, *Thermochemistry, Transport properties, Mathematical analysis, Diffusion, Coolants.

Estimates are given of the Lewis-Semenov number and the chemical contributions to the heat capacity, enthalpy, thermal conductivity, heat flux potential and Prandtl number for equilibrium dissociating hydrogen in the temperature range from 1000 to 4000 K and at total pressures of 0.1, 1.0, 10 and 100 atm. In applying these data to the nuclear-thermal rocket nozzle cooling problem, a new convection-product parameter is introduced and evaluated. It is proposed that equality of this convection-product parameter implies the approximate equality of the convective heat flux intensity regardless of physical scale, pressure level or choice of working fluid. If the nozzle cooling requirement limits the potential performance of a nuclear-thermal rocket, it is concluded that specific impulse gains can be made only by reducing the chamber pressure level. (Author)

AD-257 894 Div. 4
(21 June 61) OTS price $14.00

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
(No title)
Technical rept. no. 5, 1 Sep 60-28 Feb 61. 28 Feb 61, 1v. incl. illus. tables, 117 refs.
(Contract Nonr-269300) Unclassified report

DESCRIPTORS: *Polymers, Molecular structure, Chemical bonds, Mechanical properties, Synthesis, *Polymerization, Styrenes, Metalorganic compounds, Lithium compounds, Chemical impurities, Determination, *Stereochemistry, *Triazines, Chemical properties, Stability, Ethylenes, Elasticity, Amides, Chemical reactions.

This report includes:
DIMENSIONS OF POLYMER CHAINS, by C. A. J. Hoeve and A. A. Blumberg. 7p. incl. table.

MECHANICAL PROPERTIES OF MODEL BRANCHED POLYMERS, by H. Markovitz and M. H. Birnboim. 30p. incl. table.

SYNTHESIS AND PROPERTIES OF MODEL BRANCHED POLYMERS, by F. Wenger, S-P.S. Yen and others. 1v. incl. illus. tables.

MODELS OF STEREOREGULAR POLYMERS, by R. D. Spencer and M. R. Dysart. 3p.

TRIAZINE CHEMISTRY, by R. D. Spencer and W. T. Gormley. 79p. incl. illus. tables.

AD-257 909 Div. 4, 14
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div. Washington, D. C.
ALUMINUM-CONTAINING POLYMERS.
15 May 61, 2p. (AID rept. 61-65, Trans. from Dialkylaluminum Derivatives of Saturated and Unsaturated Acids; Akademiya Nauk SSSR. Izvestiya. Otdeleniye Khimicheskikh Nauk 2:364-365, Feb 61)
Unclassified report

DESCRIPTORS: *Polymerization, *Polymers, Copolymerization, *Metalorganic compounds, *Aluminum compounds, Carboxylic acids, Alkyl radicals, Acrylic resins, Styrenes, Stability, Light transmission, Transparent panels, USSR.

Derivatives of dialkylaluminum and saturated or unsaturated carboxylic acids were obtained. These salts were derived from unsaturated acids polymerized in the presence of an initiator (e. g., dinitrile of azoisobutyric acid) to form viscous transparent polymers which swell in some polar solvents. Copolymers of the salts with methyl methacrylate or styrene are transparent solids, insoluble in organic solvents. Unlike the homeopolymers, which decompose in the air, the copolymers were stable during the short period of observation. (Author)

AD-257 910 Div. 4, 26, 27
(22 June 61) OTS Price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
STORAGE OF LIQUID HYDROGEN.
15 May 61, 2p. incl. illus. (AID rept. 61-66, Trans. from Some Problems of the Technology of the Preparation of Liquid Parahydrogen. Khimicheskaya Promyshlennost' 2:30-34, Feb 61)
Unclassified report

DESCRIPTORS: *Hydrogen, Liquefied gases, Storage, Isotopes, Chemical reactions, Catalysis, Catalysts, Thermochemistry, Laboratory equipment, Vacuum apparatus, Hydroxides, Metallic compounds, Chromium, Nickel, Production, Cryogenics, Heat exchangers, USSR, Rocket fuels, Preparation, Chemical engineering, Synthesis.

A description is presented of three devices for catalytic conversion of ordinary liquid hydrogen into predominantly parahydrogen (up to 99.7%). The devices described are for use in conjunction with liquefying systems. The purpose of the conversion process is the extension of storage time for the liquid gas and the considerable reduction of storage losses caused by the heat of reaction of natural conversion of orthohydrogen to parahydrogen in the liquid state. The catalysts mentioned are dry hydroxides, such as $Fe(OH)_3$, $Cr(OH)_3$, and $Mn(OH)_4$, and an industrial chromium-nickel catalyst (See: Boreskov, K. G., and M. G. Lin'ko. Khimicheskaya promyshlennost', no. 2, Feb 1956, 69). Schematic diagrams of the reactors are presented. (Author)

AD-257 916 Div. 4
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
PRODUCTION OF HYDROGEN PEROXIDE,
18 May 61, 2p. (AID rept. 61-73, Trans. from Catalytic Synthesis of Hydrogen Peroxide from the Elements Themselves on Palladium. II Active Centers of Palladium in the Synthesis of Hydrogen Peroxide; Zhurnal Fizicheskoy Khimii 35:535-542, Mar 61)
Unclassified report

DESCRIPTORS: Hydrogen, *Hydrogen compounds, Oxygen, *Peroxides, Synthesis, Production, *Catalysis, *Catalysts, Palladium, Platinum, Adsorption, Chemical reactions, Reaction kinetics, USSR, Gases.

Optimum conditions were studied for the catalytic reaction on palladium with oxyhydrogen gas as the raw material. An attempt was made to clarify the mechanism of the catalysis by comparing the action of two different catalysts, palladium and platinum. On the Pd catalyst, H_2O_2 was formed in the first stage. On Pt, H_2O was the predominant yield. Experimental data and computations of the kinetics of the process indicated that the Pd catalyst has active centers consisting of two Pd atoms, unlike the active centers formed by single atoms in the Pt catalyst. Differences in catalytic action between Pd and Pt were explained by differences in adsorption and splitting of H-H and O:O molecules on the active centers. (Author)

AD-257 921 Div. 4
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
DERIVATIVES OF OZONE,
24 May 61, 1p. (AID rept. 61-81, Trans. from On the Solubility of Potassium Ozonide in Liquid Ammonia. The NH_3-KO_3 System; Akademiya Nauk SSSR. Doklady 137:612-613, 21 Mar 61)
Unclassified report

DESCRIPTORS: *Ozone, *Ozonides, *Potassium compounds, Ammonia, Liquefied gases, Eutectics, Crystals, Crystallization, Purification, Preparation, Solutions, Oxygen compounds, USSR, Separation, Solubility.

The solubility of potassium ozonide was studied at -33 to -80 C, corresponding to the liquid state of ammonia. The latter temperature corresponds to a eutectic composition with 5.1 g of KO_3 per 100 g of NH_3. Solubility at -35 C was approximately 15 g of KO_3 per 100 g of NH_3. Study of the crystallization conditions made it possible to obtain potassium ozonide in the purest form known to date, 98.1 wt-%. (Author)

AD-257 924 Div. 4, 25
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
COLLOID-SIZE GLOBULES OF HUMIC SUBSTANCES.
25 May 61, 2p. (AID rept. 61-84, Trans. from Study of Structuration in Aqueous Solutions of Humic Substances; Kolloidnyy Zhurnal 23:209-214, Mar-Apr 61)
Unclassified report

DESCRIPTORS: *Salts, Organic acids, *Colloids, Phase transitions, Sodium compounds, Molecular structure, Gels, Hydrogen ion concentration, Solutions, Molecules, Soils, USSR, Phase studies, Configuration.

A study was made on disperse systems formed by soluble salts of humic acids for the clarification of the conditions under which the transition of the colloidal states of humic substances

takes place. Low alkalinity (pH, 7 to 8) converts humic substances into a predominantly H+ form, which is formed in the shape of globular micelles with a hydrophilic shell. The spherical shape of the particles is due to the presence of numerous H- bonds between the macromolecules. In the Na humates studied an increase in pH by addition of an alkali causes the exchange of H+ ions for Na+ ions with a resultant unfolding of the globular micelles, peptization, and reduction in the average molecular weight. A sharp increase in viscosity also occurs with increased pH in consequence of the further gel formation which follows. The system thereby becomes thixotropic. The introduction of polyvalent ions, such as Ca++ or Fe+++, causes a reduction in solubility, which, with sufficiently complete ion exchange, can be followed by the precipitation of a solid-like gel with a network structure. (Author)

AD-257 971 Div. 4, 9, 25
(19 June 61) OTS price $2.60

Convair, San Diego, Calif.
CHEMICAL KINETICS IN SHOCK-HEATED AIR,
by C. B. Ludwig and K. G. P. Sulzmann. 1 Feb 61, 21p. incl. illus. tables (Rept. no. ZPh-082)
(Contract DA 04-495-ORD-3112)
(ARPA Order no. 39-59, Task 2)
Unclassified report

DESCRIPTORS: *Shock waves, *Chemical reactions, Recombination reactions, Atoms, Dissociation, Molecules, Nitrogen, Oxygen, *Superaerodynamics, Thermochemistry, Chemistry.

The concentration profile and the reaction rates of a postulated reaction scheme were estimated. It is shown that the contributions of the rates of formation and decomposition of dominant species (N2, 02, N, 0, and NO) involving these species only are greater by orders of magnitude than the contributions involving the added minor constituents (N20, N02, N03, and 03). (Author)

AD-257 975 Div. 4, 16
(19 June 61) OTS price $4.60

Central Laboratory T.N.O., Delft (Netherlands).
ENZYMATIC DEGRADATION OF COTTON CELLULOSE,
by P. Y. F. Prins-van der Meulen. Annual technical rept. no. 1, 1 Apr 60-1 Apr 61, 28 Apr 61, 1v. incl. illus. tables (Rept. no. CL 61/40)
(Contract DA 91-591-EUC-1402)
Unclassified report

DESCRIPTORS: *Cellulose, *Cotton cellulose, *Carboxymethylcellulose, *Enzymes, Bacteria, *Hydrolases, Decomposition, Chemical reactions, Hydrolysis, Ion exchange, Glucose, Separation, Nitro radicals, Phenyl radicals, Glucosides, Sodium compounds, Acetamides, Chlorides, Methanols, Chromatographic analysis, Purification, Deterioration.

Attempts to investigate the nature of CA-cotton (methylolchloro acetamide substituted cellulose) resistance to enzymatic breakdown are discussed. Combinations of powdered CA-cotton and powdered untreated cotton were incubated with cellulose. Analysis of the hydrolysis process was not feasible; the reaction fragments could not be isolated due to the lability of the methylolchloroacetamide group. Ion exchange chromatography was used as a means to purify and fractionate the cellulolytic enzymes of Myrothecium verrucaria. The cellulose was resolved into 3 enzymes or groups of enzymes. Fraction I did not hydrolyze nipheglue, had little activity towards alpha cellulose, and its activity towards sodium carboxmethylcellulose (NaCMC) was 1.7 times that of the original enzyme. Fraction II contained most of the activity towards alpha cellulose, good activity towards NaCMC, and negligible activity toward nipheglue. Fraction III contained practically all of the activity towards nipheglue and some activity towards NaCMC and alpha cellulose.

AD-258 197 Div. 4, 14
(22 June 61) OTS price $1.10

Applied Science Labs., Inc., State College, Pa.
RESEARCH STUDY OF PHYSICOCHEMICAL TECHNIQUES FOR THE PURIFICATION OF ORGANIC COMPOUNDS,
by Robert F. Sweeny and Arthur Rose. Bimonthly progress rept. no. 16, 1 Mar-1 May 61, 15 June 61, 3p. tables.
(Contract DA 18-108-405-cml-176)
Unclassified report

DESCRIPTORS: *Films, Membranes, *Organic solvents, Polymers, Semipermeability, *Organic compounds, Solutions, Hexanes, Ethanol, Methanes, Cellulose, Ethyl radicals, Cellulose acetate, Cellulose esters, Ethylenes, Fluorides, Amides, Vinyl chlorides, Vinyl alcohol, Diffusion, *Purification.

The program of determining permeation rates for hexane, ethanol, acetone, and chloroform through sixteen commercial films was completed, and all data are summarized. Data are also given for four primary solvent mixtures permeating polyethylene. It appears that at least semi-quantitative behavior for these binaries can be predicted from individual component rates. (Author)

AD-258 217 Div. 4
(19 June 61) OTS price $4.60

Naval Postgraduate School, Monterey, Calif.
A STUDY OF THE SYNTHESIS OF 2-TRIFLUOROMETHYL PYRIMIDINES,
by John A. King. Master's thesis. 1961, 36p. incl. table.
Unclassified report

DESCRIPTORS: *Pyrimidines, Synthesis, Fluorides, Methyl radicals, Chemical reactions.

Phenylbutanedione-1,3 and 2,4-pentanedione were reacted with trifluoroacetamidine in the presence of sodium ethoxide. A crystalline product melting at 38.4 C was recovered from the reaction of 2,4-pentanedione and trifluoroacetamidine and tentatively identified by its IR spectra as 2-trifluoromethyl-4,6-diemthylpyrimidine. The reaction of trifluoroacetamidine and phenylbutanedione-1,3 in the presence of sodium ethoxide yielded a white crystalline product (melting at 90.3 C) which was also tentatively identified as the 2-trifluoromethyl-4-methyl-6-phenylpyrimidine. The amidine of trifluoroacetic acid reacted in a manner described for the reaction of an amidine with a beta-diketone. Yields obtained (10-34%) were within the limits reported for many other pyrimidine syntheses, influenced in part by the instability of trifluoroacetamidine. (Author)

5. COMMUNICATIONS

AD-258 248 Div. 4
(26 June 61) OTS price $2.60

Interchemical Corp., New York.
REACTIONS OF AZIRIDINES WITH ALCOHOLS,
by P. Resnick, E. A. Meier, and others. Rept. no. 3, 16 Feb-15 May 61. 31 Mar 61, 19p. incl. illus. table.
(Contract N123(60530)24919A, Proj. 94021-500)
Unclassified report

DESCRIPTORS: Chemical reactions, *Alcohols, Ethanols, Acids, Catalysts, *Ethylenimines, Catalysis, Benzoyl radicals, Chlorides, Sulfuric acid, Methyl radicals, Amides, Glycols, Ethylenes, Propenes, Isomers, Synthesis, Hydrolysis, Polymers.

The reaction of 1-(p-chlorobenzoyl) aziridine in excess EtOH was studied, varying the acid catalysts. A rate study was done at 30 C using varying amounts of H2SO4. The isomer distribution of 2-methyl and 2,2-dimethyl aziridine and certain of their acylated derivatives was further investigated. Preliminary experiments with N,N'-(1,2-propylene)-2,3,5,6-tetrachloroterephthalamide and triethyleneglycol gave evidence of reaction under base catalysis, as indicated by marked viscosity increases. (Author)

AD-258 252 Div. 4
(19 June 61) OTS price $1.60

Purdue U., Lafayette, Ind.
RARE EARTH OXIDE SYSTEMS. PART II. THE INFRARED SPECTRA OF PRASEODYMIUM OXIDE AND PRASEODYMIUM CARBONATE,
by Paul A. Faeth and Alan F. Clifford. 17 Apr 61, 17p. incl. illus. table, 15 refs.
(Contract AF 18(603)45)
(AFOSR-724) Unclassified report

DESCRIPTORS: *Rare earths, *Praseodymium compounds, *Oxides, Infrared radiation, Absorption, Hydroxides, Chemical bonds, Crystal structure, Decomposition, *Carbonates, Analysis, Infrared spectroscopy.

Several samples of PrOx have been prepared which have x values between 1.50 and 1.83; by decomposing PrO1.83 in vacuo any x value could be prepared. The preparations were analyzed for infrared absorption activity in the region 2-16 microns. An absorption band at about 15 microns appeared for all samples if the specimens were permitted access to the atmosphere. No band appeared in this region if the samples were analyzed immediately after their preparation. Infrared analysis of samples of praseodymium carbonate and praseodymium hydroxide showed absorption activity in the same regions where activity was noted for air-exposed praseodymium oxide samples. It is concluded that the absorption band at 15 microns for the air-exposed oxides is due to hydration-carbonation effects. A sample of praseodymium carbonate was decomposed in vacuo and the spectrum of the resultant compound was observed. A differential thermal analysis of the carbonate in air showed that the dehydration probably is complete below 300 C.; the carbonate loses CO2 at 470 C. and 630 C. and is subsequently converted to the oxide Pr6O11 near 400 C. (Author)

AD-257 738 Div. 5
(16 June 61) OTS price $1.60

Diamond Ordnance Fuze Labs., Washington, D. C.
A PREDETECTION DIVERSITY COMBINER,
by R. A. Parkhurst. 30 Mar 61. 22p. incl. illus.
(DOFL rept. no. TR-926)
(Proj. 24250)
Unclassified report

DESCRIPTORS: Radio receivers, *Diversity reception, *Telemetering receivers, Frequency modulation, Phase detectors, Signal to noise ratio.

A two channel, predetection diversity combiner is described. The combiner uses two commercial telemetry receivers as a basis; the necessary subchasses were constructed to (1) combine the expected signal from two antennas to improve the signal-to-noise ratio and (2) measure the relative phase of the signals at the two antennas. Photographs demonstrate the improved signal-to-noise ratio of the system. (Author)

AD-257 827 Div. 5
(16 June 61) OTS price $7.60

Tracerlab, Inc., Waltham, Mass.
AN ANALYSIS OF COSMIC NOISE IN X-RAY COMMUNICATION SYSTEMS,
by Charles A. Ziegler and John Kirkbride.
20 Apr 60, 69p. incl. illus. tables, 68 refs.
(Rept. no. G-471)
(Contract AF 30(602)2189, Proj. 4519)
(RADC TN 61-87) Unclassified report

DESCRIPTORS: *X-rays, *Communication systems, Communications theory, Space flight, Ionization, Space environmental conditions, *Cosmic rays, *Solar noise, Radiation counters, Solar flares.

A survey was made of existing knowledge concerning ionizing radiation in space. It was undertaken as part of a broader investigation of the feasibility of an x-ray space communication system. An attempt is made to provide as definitive an answer as it is presently possible to make the question of the nature and magnitude of environmental background radiation in regions of space that are of interest. Three topics are discussed in detail: (1) cosmic rays, (2) geomagnetically trapped corpuscular radiation, and (3) radiation from the sun. Each of these topics is divided into two parts; the first part provides a brief review of basic facts and theory, while the second part considers the topic in the context of x-ray space communication. (Author)

AD-257 868 Div. 5
(20 June 61) OTS price $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
A CODING CRITERION FOR CONTINUOUS CHANNELS DERIVED FROM LIKELIHOOD ESTIMATION,
by T. L. Grettenberg. Rept. on Communications. Mar 61, 34p. incl. illus. (Rept. no. LMSD-894811, Supersedes Stanford Electronics Labs., Stanford U., Technical rept. no. 2004-1, AD-253 548)
Unclassified report

DESCRIPTORS: *Information theory, Probability, *Coding, Errors, *Radio communication systems, Communication systems, Radio receivers, Noise (Radio), Integral equations, *Communications theory, Statistical analysis.

The divergence between hypotheses is investigated as a criterion for signal selection, and is shown to be useful whenever the probability of error cannot be directly evaluated. After a brief discussion of the divergence in hypothesis-testing problems, the relation between the divergence and the information transfer of the channel is determined. As an illustration of the use of the divergence as a coding criterion, the criterion is applied to a finite set of known signals in additive noise. The divergence is evaluated for this example and compared with the probability of error in a maximum-likelihood receiver. (Author)

AD-257 891 Div. 5, 8
(21 June 61) OTS price $21.00

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
ELECTRONIC EQUIPMENT INTERFERENCE CHARACTERISTICS-COMMUNICATION TYPE,
by C. E. Blakely, R. N. Bailey and others. Appendix to Quarterly rept. no. 12, 30 June 60, 358p. 1338 refs.
(Contract DA 36-039-sc-74855, Proj. A-343)
Unclassified report

DESCRIPTORS: *Radio interference, *Bibliography, *Communication equipment, Radio receivers, Radio transmitters, Radiofrequency amplifiers, Amplitude modulation, Antennas, Communications theory, Frequency modulation, Phase modulation, Radiofrequency filters, Modulation, Noise (Radio), Sidebands, Reduction, Television, Test equipment, Test methods, Radio communication systems.

The research objective is the preparation of a catalogue listing the technical and tactical characteristics of all U.S. Army non-radar type electronic equipments, in particular, the radio interference producing and susceptibility characteristics. Results are presented of a literature survey which was conducted in conjunction with the measurements and computer program over a period of three years. The bibliography is arranged by subject index, author index, and abstracts. (Author)

AD-257 949 Div. 5, 8
(19 June 61) OTS price $12.00

RCA Defense Electronic Products, Camden, N. J.
HIGH EFFICIENCY UHF POWER GENERATOR,
by I. Joffee. 1 May 61, 153p. incl. illus. tables, 66 refs.

(Contract AF 33(616)6231, Proj. 4335)
(ASD TR 61-112) Unclassified report

DESCRIPTORS: *Microwave communication systems, Radio communication systems, *Spaceships, *Communication equipment, *Microwave amplifiers, Ultra high frequency, Power amplifiers, Airborne, Semiconductors, Impedance, Modulation, Electronic circuits, Microwave equipment, Electron tubes, Communications theory, Design, Radio equipment, *Radiofrequency generators.

A high efficiency UHF generator system is described which illustrates novel design and circuitry. The feasibility model developed does not have the final form factor or the final parts envisioned for the ultimate equipment, but does use those new techniques which are presently undergoing development and which promise to be available in the early 1960's. The equipment was developed on a building block basis, and incorporates the translator concept now in use at HF and UHF frequencies. Strong consideration was accorded in furthering the state of the art. The extensive use of semiconductors and the exciter-power amplifier approach are direct results of this investigation. The system described shows promise of meeting the stringent requirements of the space age. (Author)

AD-257 965 Div. 5, 2, 12
(19 June 61) OTS price $9.60

Allied Research Associates, Inc., Boston, Mass.
TIROS METEOROLOGY,
by Arnold H. Glaser. Final rept. 31 Mar 61, 109p. incl. illus.
(Contract AF 19(604)5581)
(AFCRL-613)
(ARPA order no. 26-59) Unclassified report

DESCRIPTORS: Weather forecasting, *Satellite vehicles, *Meteorological data, Aerial photographs, Clouds, Cyclones, Telemetering data, Television communication systems, Effectiveness.

TIROS II continued the meteorological observational series begun so brilliantly with TIROS I. Further analyses of pictures from both TIROS I and II show how the cloud patterns respond to physical processes. In a cold air outbreak off the northeast coast of the US it was observed that the cloud edge accurately mirrored the shape of the coast line, displaced some 75 miles to sea. This was found to be the distance required to bring the appropriate heat and moisture to a reasonable mixing condensation level. In another case, a wake behind a mountain peak was observed in clouds limited by an inversion. It is possible to show that this is an analog to the supersonic wake behind an obstacle. One of the most striking features of TIROS pictures was the strong pattern exhibited by cyclonic storms. It was possible to trace the life history of cyclones as evidenced by these patterns. It is evident from the sequence of patterns that there is much about the life history of the cyclone that is not adequately described by conventional models. A review of techniques of TIROS data reduction indicates that substantial progress was made in facilitating the use of satellite meteorological information. (Author)

AD-257 983 Div. 5
(19 June 61) OTS price $4.60

Dikewood Corp., Albuquerque, N. Mex.
COMMUNICATION APPLICATIONS OF INFORMATION THEORY,
by B. L. Basore. Final rept. 29 Dec 60, 37p. incl. illus. (Rept. no. DFR-1004)
(Contract AF 30(602)1890, Proj. 4519)
(RADC TR 61-107) Unclassified report

DESCRIPTORS: *Information theory, Learning, *Communications theory, Coding.

A mathematical model of communication in a situation in which learning occurs is taken from an earlier report and summarized together with slight modifications. The modifications are necessary to introduce properly some new work clarifying the more subtle features of the model which are subject to criticism. It is shown that the equivocation measuring the uncertainty about what message was transmitted is greater in a learning situation than in the case covered by conventional communication theory and that

this increase is more than the amount of information which may be learned from the one transmission about the statistical description of the transmitter's message set. For the sake of completeness, reviews of summaries completed under this study contract on noisy feedback in communications and on the capacity of a fluctuating link are appended. (Author)

AD-258 019 Div. 5, 1
(21 June 61)

Blonder-Tongue Labs., Inc., Newark, N. J.
VOICE INTELLIGIBILITY EQUIPMENT,
by H. R. Walker. Final rept. 30 Nov 60, 60p. incl. illus.
(Contract FAA/BRD-146)
Unclassified report

DESCRIPTORS: *Voice communication systems, *Speech, Speech transmission, Intelligibility, Audiofrequency, Radiofrequency filters, Acoustics, Radio communication systems, Radio inteference, *Air traffic control systems, Tests, Electronic circuits, Design, Test equipment, Test sets.

Experiments with the Blonder-Tongue Audio Baton indicated that a bank of filters tuned to specific audio frequencies could be useful in improving voice intelligibility. It was felt that these filters could be used to attenuate noise and distortion without appreciably affecting the frequencies necessary for intelligible speech. Filter units were constructed and psychoacoustical tests were made under a variety of conditions to prove this theory. It was found that the audio filters could significantly improve the intelligibility of weak received signals. A slight improvement in the clarity of transmitted signals was also noted. As a result of these studies, a ten channel voice intelligibility unit was developed and constructed. (Author)

AD-258 263 Div. 5, 12
(20 June 61) OTS price $2.60

Rome Air Development Center, Griffiss Air Force Base, N. Y.
SOLUTION TO REAL TIME MULTIPLE SATELLITE AND WEST FORD TYPE COMMUNICATIONS SYSTEMS COVERAGE REQUIREMENT,
by Henry Hoffmann, Jr. Apr 61, 19p. incl. illus. table (RADC TN 61-25)
(Proj. 4519)
Unclassified report

DESCRIPTORS: *Satellite vehicles, Radio communication systems, *Radio waves, Propagation, Mathematical analysis, Algebra, Integral equations, Communication systems.

This report discusses the problem of developing a mathematical model whereby a coverage diagram versus time can be plotted such that the criteria for continuous coverage between any two ground stations can be determined. It is seen that for any given two station locations and orbit parameters the number of satellites per orbit can be quickly determined. (Author)

AD-258 320 Div. 5, 1
(22 June 61) OTS price $1.10

National Aviation Facilities Experimental Center, Atlantic City, N. J.
TRANSPORT AIRCRAFT COCKPIT VOICE RECORDING,
by F. W. Jefferson. Final rept. Dec 60, 5p. illus.
Unclassified report

DESCRIPTORS: Aviation personnel, *Aviation accidents, *Recording devices, *Transport planes, Flight testing, *Intercommunication systems, Human engineering, Tests, Noise, Microphones, Headphones, Civil aviation, Reduction, Magnetic tape, Intelligibility, Cockpits, Airborne, *Voice communication systems, *Acoustics.

Tests were conducted utilizing three aircraft, a C-131, a DC-3, and a Grumman Gulfstream, to determine the most desirable method for recording crew conversations as an aid to accident investigation. Currently available area and individual pickup-type microphones were employed. The application of electronic noise-filtering and noise-cancelling techniques was investigated for improving the intelligibility of the recorded voice. It was concluded that the recording of crew conversation in transport aircraft utilizing area pickup-type microphones is feasible. (Author)

6. DETECTION

AD-257 624 Div. 6, 8
(14 June 61) OTS price $16.00

Defense Research Lab., U. of Texas, Austin.
CROSS SECTIONS AND POLARIZATION RATIOS OF DIPOLE CLOUDS,
by B. N. Brown. 15 Sep 60. 1v. illus. tables.
(DRL AF Technical memo. no. 53; Supersedes DRL AF Technical memo. no. 53, AD-245 567)
(Contract AF 33(616)5164, Proj. 4025)
(Appendix B to ASD TN 61-37, AD-323 616)
Unclassified report

DESCRIPTORS: *Radar confusion reflectors, Polarization, Radar reflections, *Radar echo areas, Metal films, Tables, *Electromagnetic wave reflection, Fall bodies.

Measurements indicated that clouds of falling dipoles are either predominantly vertical or predominantly horizontal. A program for computing responses from horizontal and vertical dipoles by means of an IBM 650 digital computer has been written and some results are presented. The program has provided the cross section of a vertical dipole to vertically polarized radars; the average cross section of a horizontal dipole to vertically polarized radars; and the average cross section of a horizontal dipole to horizontally polarized radars. The indicated argument in these symbols is the angle between the dipole and vertical. The cross-section average is made under the assumption that the azimuth distribution for horizontal dipoles is uniform. A program was written for computing the ratio of the vertical radar response to the horizontal radar response from a dipole cloud in which a fraction of the dipoles are vertical, the remainder being horizontal. (Author)

AD-257 625 Div. 6
(14 June 61) OTS price $10.10

Defense Research Lab., U. of Texas, Austin.
DIPOLE CROSS SECTIONS COMPUTED BY VARIATIONAL

TECHNIQUES,
by B. M. Brown. 5 Apr 61, 1v. incl. tables (DRL AF Technical memo. no. 59)
(Contract AF 33(616)5164, Proj. 4025)
(Appendix H to ASD TN 61-37, AD-323 616)
Unclassified report

DESCRIPTORS: *Radar echo areas, Functional analysis, *Radar confusion reflectors, Polarization, *Radar reflections, Tables, Analysis, Measurement, *Radar reflectors.

The results of dipole cross section measurements are presented. They indicate that: (1) the horizontal-vertical distribution should be used for dipoles falling in non-turbulent air when the dipoles are less than three inches in length, (2) as dipoles increase in length, there is a gradual shift nearer to the random-orientation distribution, (3) neither distribution accounts completely for the actual measured cross sections, and (4) the tables which are presented give results 1.5 db nearer the measured values than cross sections computed on the basis of the Van Vleck method. This is an improvement in accuracy in excess of 40%. Since this corresponds to a reduction of 40% in the weight of chaff needed to produce a given echo, it is obviously of great importance to the designer of operational chaff systems. (Author)

AD-257 626 Div. 6
(14 June 61) OTS price $4.60

Defense Research Lab., U. of Texas, Austin.
THE DISPENSING AND BEHAVIOR OF CHAFF IN SPACE,
by J. H. Henson and J. W. Craig. 12 Apr 61, 1v. incl. illus. tables (DRL AF Technical memo. no. 58)
(Contract AF 33(616)5164, Proj. 4025)
(Appendix G to ASD TN 61-37, AD-323 616)
Unclassified report

DESCRIPTORS: *Radar confusion reflectors, Upper atmosphere, *Satellite vehicles, Vapor pressure, Theory, Orbital flight paths, Perturbation theory, Velocity, Mathematical analysis, Release mechanisms, Radar reflectors, Scattering.

Investigations were conducted in two areas of the space-chaff problem. First, an experimental study was made to determine some possible methods of dispensing chaff at very high altitudes. Secondly, the behavior of chaff when dispensed from an earth satellite in a circular orbit was investigated. It was concluded that: (1) the vapor-pressure technique is very effective for separating dipoles in a space-like environment, (2) when dispensing fluid-saturated chaff in a low-pressure environment, the dipole velocity is approximately linear with the square root of the fluid vapor pressure, (3) chaff dispensed omnidirectionally from a vehicle in a circular geocentric orbit will form a belt around the earth, and (4) chaff given a uniform dispensing velocity perpendicular to the original circular orbital velocity will produce a chaff cloud which grows and changes in some cyclic manner. The cycle will repeat once each orbit and the cloud theoretically will not form an earth belt. (Author)

AD-257 740 Div. 6, 16, 22
(15 June 61) OTS price $2.60

Frankford Arsenal, Philadelphia, Pa.
PLAN FOR FIELD EVALUATION OF VISION CAPABILITY FROM ARMORED VEHICLES,
by P. R. Yoder, Jr. and A. J. Britten. Technical rept. May 61, 24p. incl. illus. tables (Memo. rept. no. M61-22-1)
(Proj. TW-407AJ)
Unclassified report

DESCRIPTORS: Visual perception, Effectiveness, Armored vehicles, Space perception, *Visual acuity, Optometry, Personnel, *Optical instruments, Test methods, Instrumentation, Fire control, Tests, Design, *Optical equipment, Tanks, *Telescopes, Optical systems.

A new type of optical device called the overlapping monocular system has been conceived to meet the requirement for extremely large instantaneous field of view. This device requires scanning by the observer-instrument combination to achieve 360 degrees azimuth coverage. Stereoscopic vision is achieved in part of the field. The particular instrumentation developed for this program provides unity power vision with variable fields of view as large as 140 degrees horizontal by 90 degrees vertical and variable exit pupil diameters as large as 15 mm. Two such instruments are available for use. In this report, a plan is developed for utilizing this special instrumentation in a field test program which is intended to provide the necessary data for correlation of crew performance with vision system parameters utilized. Tests of the open and closed hatch modes are included only to establish the same performance capability information for existing vehicles. (Author)

AD-257 741 Div. 6, 16, 22
(15 June 61) OTS price $2.60

Frankford Arsenal, Philadelphia, Pa.
EXPLORATORY FIELD TESTS UTILIZING WIDE ANGLE VISION SYSTEMS,
by A. J. Britten and P. R. Yoder, Jr. Technical rept. May 61, 26p. incl. illus. tables. (Test rept. no. T61-9-1)
(Proj. TW-407AJ)
Unclassified report

DESCRIPTORS: Vision, Instrumentation, *Optical instruments, Tests, Armored vehicles, Design, Fire control, Detection, *Visual perception, Visual acuity, Personnel, Effectiveness, Analysis, *Optical equipment, Optical systems, *Telescopes, Tanks.

An exploratory field test program was conducted to indicate appropriate test procedures and instrumentation parameters for a more comprehensive study. Results of exploratory tests were inadequate for quantitative evaluation of the two instrumented modes of observation or of the currently used open and closed hatch (vision block) modes of observation. However, the results did indicate the feasibility of the proposed research program and provided guidelines for the design of that program and for analysis of the data to be generated. (Author)

AD-257 879 Div. 6, 5, 12
(21 June 61) OTS price $1.60

RCA Defense Electronic Products, Camden, N. J.
SHORT RANGE MISSILE LAUNCH LOCATOR AN/TNS-5 ( )
by R. Richter, R. M. Carrell, and C. W. Fields. Final rept., 15 Apr 58-28 Feb 61. Feb 61, 18p. incl. illus.
(Contract DA 36-039-sc-75034, Proj. 3-22-04-402)
Unclassified report

DESCRIPTORS: *Guided missile launchers, *Launching sites, *Detection, Position finding, Transducers, Acoustics, Recording devices, Microphones, Acoustic detectors, Magnetic tape, Crystal oscillators, Display systems, *Data processing systems, Electronic circuits, Servomechanisms, Cathode ray tube screens, Sound ranging, *Ordnance locators.

The basic concept of the AN/TNS-5 system is described. Enemy weapons fire detected by four microphones is recorded at 25 ips on a 300 ft magnetic tape loop stored in a bin. Permanent timing numerals are printed on the tape, which can be read to .01 sec over the 4 hr length of the loop. The timing reference is a 1.310720 MC oven-controlled crystal oscillator with a stability of 1 part in 10,000,000 over a 24 hr period. A capstan servomechanism using the tape timing marks and oscillator provides precise control of recording speed. A rotating six-channel playback head assembly repetitively scans a short section of tape for continuous cathode ray tube display of the 4 microphone signals. The remaining two playback head channels scan the two outside magnetic tracks on the tape and automatically provide means for electronically correcting tape skew. (Author)

AD-257 927 Div. 6, 2, 12, 25
(22 June 61) OTS price $1.60

Science and Tech. Section, Air Information Div., Washington, D. C.
TRACKING OF MISSILES AND SPACE VEHICLES. REVIEW OF SOVIET LITERATURE.
Monthly rept. no. 11 for May 61, 31 May 61, 11p. incl. illus. (AID rept. 61-78)
Unclassified report

DESCRIPTORS: *Guided missiles, Surface to surface, *Satellite vehicles, Tracking, *Guided missile tracking systems, USSR, *Plasma physics, Technological intelligence, Ionospheric disturbances, Attenuation, Magnetohydrodynamics, *Electromagnetic waves, Conductivity, Viscosity, Electromagnetic properties, *Radio astronomy, *Radar tracking, Microwave oscillators, Ionosphere, Perturbation theory.

Contents:
ND3 molecular beam maser oscillator
Attenuation of magnetohydrodynamic waves in a medium with anisotropic conductivity and viscosity
Selecting pulse duration of a radar for recording weak meteors
Equipment for measuring density of free electrons in the ionosphere with the aid of rockets
Observation of some discrete sources of radiation on the 3.2-cm wave
On the problem of the instability of low-frequency electromagnetic waves in the plasma penetrated by a beam of charged particles
A method of measuring charge density in a plasma with a superhigh-frequency resonant probe
Electromagnetic properties of a relativistic plasma
Radar observations of Venus

AD-257 944 Div. 6, 8
(20 June 61) OTS price $10.10

Temco Electronics, Dallas, Tex.
TECHNICAL MANUAL FOR QRC-94A-1(T) VIDEO CORRELATOR.
1960, 1v. incl. illus. tables.
(Contract AF 33(604)30983)
Unclassified report

DESCRIPTORS: *Radar signals, *Video signals, Correlation techniques, *Handbooks, *Instruction manuals, Maintenance, *Search radar, Airborne, Detection, Radar interference, Reduction, Display systems, Radar equipment, *Plan position indicators, Electronic circuits, Installation, Operation.

A handbook is presented to provide complete instructions for operating and maintaining the QRC-94A-1(T) video correlator. The QRC-94A-1(T) is designed to increase the probability of detection of the AN/APS-45 radar set. The correlator enables the radar indicator to display a darker presentation by eliminating all non-synchronous signals. The design criteria for this compact, light weight, fabricated unit was simplicity of operation with a high degree of stability and reliability. This correlator model is designed for integration with the AN/APS-45 radar set. This radar set has a pulse width of 1.8 microseconds and a pulse repetition rate of 450 PPS(2222 microsecond interpulse period). The QRC-94A-1(T) provides the following functions: (1) processes the video to reduce the effects of sea clutter and interference, (2) generates the radar range marks, (3) provides the radar system trigger, and (4) provides a test target signal for alignment and test purposes. (Author)

AD-257 945 Div. 6, 8
(20 June 61) OTS price $10.50

Temco Electronics, Dallas, Tex.
TECHNICAL MANUAL FOR QRC-94A-2(T) VIDEO CORRELATOR,
1960, 1v. incl. illus. tables.
(Contract AF 33(604)30983)
Unclassified report

DESCRIPTORS: *Radar signals, *Video signals, Correlation techniques, *Handbooks, *Instruction manuals, Maintenance, *Search radar, Airborne, Detection, Radar interference, Reduction, Display systems, Radar equipment, *Plan position indicators, Electronic circuits, Installation, Operation.

A handbook is presented to provide complete instructions for operating and maintaining the QRC-95A-2(T) video correlator. The QRC-94A-2(T) is designed to increase the probability of detection of the AN/APS-95 radar set. The correlator enables the radar indicator to display a darker presentation by eliminating all non-synchronous signals. The design criteria for this compact, light-weight unit was simplicity of operation with a high degree of stability and reliability. This correlator model is designed for integration with the AN/APS-95 Radar Set. This radar set has a pulse width of 6 microseconds and a pulse repetition rate of 280 PPS (3570 microsecond interpulse period). The QRC-94A-2(T) provides the following functions: (1) processes the video to reduce the effects of sea clutter and interference, (2) provides the radar system trigger, and (3) provides a test target signal for alignment and test purposes. (Author)

AD-258 004 Div. 6, 8
(21 June 61) OTS price $1.60

Army Air Defense Board, Fort Bliss, Texas.
EVALUATION OF RADAR SHELTER FOR ACQUISITION RADAR SET AND TRACK ANTENNAS OF AIR DEFENSE GUIDED MISSILE SYSTEMS, NIKE HERCULES AND NIKE AJAX.
25 May 61, 1v. incl. illus. (Proj. GM-1360)
Unclassified report

Division 6 - DETECTION

DESCRIPTORS: *Radomes, Tests, *Guided missiles, Guidance, Radar equipment, Radar, *Radar tracking, Radar antennas, Antennas, Search radar, Maintenance, Surface to air, Weatherproofing.

Tests were conducted to determine the adequacy, suitability, and compatibility of the air supported radome in a fixed installation, to provide shelter for: (1) acquisition, target tracking, and missile tracking radar equipment and personnel performing maintenance and operational checks and adjustments of the radars housed in the radome. The radome is an air supported 5/8th sphere of single-ply, vinyl coated nylon. It has a maximum diameter of 27 feet and base diameter of 24 feet, an over-all height of 19 feet 8 inches, and weighs 280 pounds. It provides complete coverage for acquisition or track antennas, ground or tower mounted, and is designed to withstand wind loads of 100 mph. From the tests it was concluded that: (1) adequate procedures were not provided for installation, erection, maintenance, and repair of the radome shelters. Corrective actions for the deficiencies are recommended. (2) There is no apparent degradation in performance of radars due to use of the radome shelters. (3) The radome shelters provide the desired protection to equipment and personnel.

AD-258 008 Div. 6
(21 June 61) OTS price $1.10

Army Air Defense Board, Fort Bliss, Texas.
CHECK TEST OF TEST SET, AN/UPM-81.
25 May 61, 5p. (Proj. TF-2060)
Unclassified report

DESCRIPTORS: *Test sets, Tests, L-band, *Search radar, Antiaircraft defense systems, Radar equipment, Radar tracking, Radar reflections, *Simulation, Test equipment, *Radar signals.

Test set, AN/UPM-81 is a radar signal simulator which takes RF signals from the radar transmitter and returns simulated RF target signals to the radar receiver; thus, the simulator can test the entire radar system except the antenna. The following tests can be made with the simulator: (1) radar frequency measurement, (2) range accuracy and range linearity, (3) relative receiver sensitivity and noise level, (4) relative radar power output, (5) transmitted radar pulse check, (6) over-all cancellation ratio, (7) over-all subclutter visibility, and (8) radar phase detector response. It was concluded from the tests that the AN/UPM-81 Test Set will not perform any tests on the L-Band air defense radars which cannot be performed by presently furnished or built-in test equipment, and that the test set does not have sufficient reliability.

AD-258 196 Div. 6, 22, 30
(26 June 61) OTS price $1.60

Telemetering Corp. of America, Sepulvedo, Calif.
DESIGN STUDY OF AN INTEGRATED AIRBORNE TELEMETRY SYSTEM,
by Hugh Pruss. Progress rept. nos. 9-10, 1 June-31 July 60. 31 July 60, 7p. incl. illus. (Engineering rept. no. 707)
(Contract DA 28-017-501-ORD-3577, Proj. TN2-8106)
Unclassified report

DESCRIPTORS: *Telemeter systems, Airborne, Multiplex transmission, *Telemetering transmitters, *Electronic circuits, Crystal oscillators, Amplifiers, Transistors, Tests, Frequency modulation, Impedance, Radiofrequency amplifiers, Design, *Rockets, Packaging.

Minor parts were designed and made for the transmitter, as well as the case and cover. The mixer amplifier was also designed. Four voltage controlled oscillator testing units were constructed for the following frequencies; channel 13, 14.5 kc ± 7.5%; A, 22 kc ± 15%; B, 40 kc ± 15%, C, 70 kc ± 15%. The electrical performance specifications were met or exceeded for all units. A typical temperature stability and linearly performance is given. The fabrication and testing of the events multiplexer was completed. The unit was potted and tested over the temperature range of 0 to 75 C. The only detectable change in performance was a slight drift in the clock frequency of ± 20 cps. This is approximately a 0.2% drift. Due to the design of the gates which operate as synchronous clamps, no detectable output level drift was observed. The repackaging and size reduction of the mixer amplifier was accomplished by utilizing smaller components and a higher packing density. The transmitter modulator and the RF power amplifier were cascaded with satisfactory reeults. Power output was approximately 410 mw. (Author)

AD-258 206 Div. 6, 8
(26 June 61) OTS price $1.60

Radiation, Inc., Melbourne, Fla.
TELEMETRY TRANSDUCER HANDBOOK,
by H. F. Fisher, Jr. Monthly progress rept. no. 1 for period ending 15 June 61. 22 June 61, 16p. incl. illus.
(Contract AF 33(616)8309, Proj. 4107)
Unclassified report

DESCRIPTORS: *Handbooks, *Telemeter systems, *Transducers, Calibration, Instrumentation, Research program administration, Standards, *Pressure switches, Test methods.

Investigations are concerned with up-dating and expanding the Telemetry Transducer Handbook which was recently prepared by Radiation for the Aeronautical Systems Division (formerly Wright Air Development Division), Air Research and Development Command. Volume I of the handbook contains sections on radio telemetry systems, transducer fundamentals, transducer applications, transducer testing and calibration techniques and facilities, a list of references, a bibliography, and appendices. Volume II contains a listing of transducer manufacturers, data sheets on approximately 350 transducers, outline drawings, and information on transducer research and development programs. This investigation makes possible a continuation of effort towards improving, up-dating and expansion of the handbook. (Author)

AD-258 328 Div. 6, 24
(23 June 61) OTS price $2.60

Naval Ordnance Test Station, China Lake, Calif.
OPERATION MANUAL FOR THE FLIGHT LINE RECORDER,
by Cele Newman. 24 Mar 61, 22p. incl. illus. tables (Rept. no. NOTS TP 2639)
Unclassified report

DESCRIPTORS: *Instruction manuals, *Photographic recording systems, Instrumentation, Operation, Naval personnel, Naval air stations, *Tracking, Cameras, High speed cameras, High speed photography, *Optical tracking.

The Flight Line Recorder (FLR) is a fixed-position cineballistic camera which rotates 180 degrees on a trunnion axis. The FLR was developed

at the U. S. Naval Ordnance Test Station, China Lake, California to record high-speed aerial events. The camera records 10 frames per second, after an effective exposure of 1 millisecond, on 180-foot rolls of 9 1/2-inch safety film. In each frame the position of the object being tracked is related by photographing it against a grid which shows elevation and azimuth. Timing is recorded by photographing a block of shutter-pulsed neon lights which are arranged in a binary-coded decimal (BCD) form. (Author)

AD-258 345 Div. 6, 8
(22 June 61) OTS price $2.60

Microwave Associates, Inc., Burlington, Mass.
INVESTIGATION OF DUPLEXING TECHNIQUES AT HIGH DUTY CYCLE CONDITIONS,
by Harold S. Maddix. Quarterly progress rept. no. 2, 1 Feb-30 Apr 61. 30 Apr 61, 10p. illus. table.
(Contract DA 36-039-sc-87385, Proj. 3A-99-13-001)
Unclassified report

DESCRIPTORS: *Radar duplexers, *Microwave equipment, *Phase shifters, Quartz, Gas discharges, Gases, Manganese compounds, Magnesium compounds, Ferrites, Intermetallic compounds, Switching circuits, Semiconductors, Waveguides, Design, Tests, X-band.

The theoretical and experimental study of means for developing duplexing techniques at microwave frequencies was continued. Experimental results are presented for two different devices utilizing quartz capsules filled with different gases. A magnesium manganese ferrite phase shifter was operated at 3 kilowatts average power at 9500 mc without external cooling. Insertion loss of the device was 0.12 db with cooling. Test results are given for a pill varactor limiter assembly operated at a 0.25 duty cycle. (Author)

7. ELECTRICAL EQUIPMENT

AD-257 619 Div. 7, 25
(14 June 61) OTS price $15.50

Pratt and Whitney Aircraft East Hartford, Conn.
MAGNETOHYDRODYNAMIC POWER GENERATOR FEASIBILITY STUDY.
Final engineering rept. Feb 61, 1v. incl. illus. 66 refs. (PWA rept. no. 1940)
(Contract AF 30(602)2268)
(RADC TR 61-104)
Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Generators, *Power plants, Power supplies, Magnetic fields, Electron tubes, Discharge tubes, Electrodes, Cathodes (Electron tubes) Anodes (Electron tubes), Conductivity, Ion sources, Potassium compounds, *Electric power production, Mach numbers.

The feasibility was investigated of generating large quantities of power by magnetohydrodynamics. The required characteristics of the generator included an output of 1000 mw at 1500 v, capability of starting within 10 sec, ability to operate continuously for periods between 10 sec and 1/2 hr, and a total life of 20 hr. A generator was designed to produce a net output of 1000 mw in an MHD section 20 feet long. Total generator length including exhaust ducts was less than 80 feet. The plasma was created by seeding the combustion products of a hydrocarbon fuel and O with KNO2. The magnetic field is produced by a copper-coil electromagnet which is cooled by liquid O to reduce the electrical heating losses. The studies indicated that the MHD concept is potentially attractive as compared to conventional means of generating power. (Author)

AD-257 628 Div. 7, 1, 12
(14 June 61) OTS price $1.60

Tactical Air Command, Langley Air Force Base, Va.
OPERATIONAL TEST AND EVALUATION GAS TURBINE COMPRESSOR AND POWER UNIT MODEL GTCP-85-91.
Final test rept. Apr 61, 8p. incl. illus.
Unclassified report

DESCRIPTORS: *Gas turbines, Gas generator engines, *Air conditioning equipment, Power supplies, Mobile, Maintenance, Radar equipment, Tests, Generators, *Electric power production, Antiaircraft defense systems.

A test was conducted to determine the suitability of using gas turbine power units in place of heavier conventional gasoline power units for the Air Weapons Control System (AWCS) 412L. As a result of this test it was determined that the GTCP-85-91 gas turbine unit is reliable, provides stable power and will accept an abnormal heavy starting load without difficulty. It is suitable for providing 60 or 400 cycle ground power to the AWCS 412L system. The lightweight turbine is readily transportable and quickly placed in operation. It will accept full load within 25 seconds after start. It is easily maintained and comparatively trouble free. Overhaul time is much less than for conventional engines. (Author)

AD-257 761 Div. 7
(16 June 61) OTS price $3.60

Mallory Battery Co., Cleveland, Ohio.
MAGNESIUM PRIMARY CELLS AND BATTERIES,
by C. G. Birdsall. Final rept. 13 Dec 60, 31p. incl. tables.
(Contract DA 36-039-sc-73233)
Unclassified report

DESCRIPTORS: *Primary batteries, *Dry cells, Design, *Magnesium, Magnesium compounds, Magnesium electrodes, Bromides, Tests, Power supplies.

Research was undertaken to develop and produce in pilot quantities, various types of paperlined dry cells and battery packs, using Mg cans. The test program showed that pilot quantities of paper lined dry cells and battery packs could be successfully using Mg cans in accordance with techniques and formulations outlined by the Battery Development Section, Power Sources Branch, Fort Monmouth, New Jersey. All the batteries in this contract gave satisfactory performance except those made with the N size cell (BA-414/U-XM and BA-416/U-XM). Examination of the cells in these 2 batteries indicated that the welding of the connecting wires can contribute to low service especially after 113 degree storage due to the 0.020-in. wall through which the weld may pierce leading to drying out of the cells. (Author)

Division 7 - ELECTRICAL EQUIPMENT

AD-257 780 Div. 7, 8, 20
(16 June 61) OTS price $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
PRECISION VOLTAGE REFERENCE SUPPLY,
by W. E. Smith. 9 May 61, 16p. incl. illus. (Rept. no. NRDL-TR-508)
Unclassified report

DESCRIPTORS: *Cyclotron magnets, *Cyclotrons, *Voltage regulators, Power supplies, *Diodes, Electron tubes, Design, Relinbility, Magnetic fields, Measurement, Operation, Maintenance, Tests, Magnets, Stability.

In the operation of the model magnet for cyclotron design studies the need arises for an ultra stable voltage reference supply. It is necessary that the supply be capable of delivering 1.2 to 1.4 milliamperes to a 1100 ohm load. The voltage reference should be stable to 0.005% over a day's time, operating essentially at room temperature with a maximum variation of 5 C. A device was constructed that used two voltage reference tubes and three zener diodes to obtain this regulation. The voltage supply was placed in an environment in which it was to be used and was monitored for over a month. The standard deviation of the voltage measurements made was 0.0017% with the maximum deviation observed being 0.0023% (Author)

AD-257 788 Div. 7, 12, 25
(20 June 61) OTS price $3.50

Electro-Optical Systems, Inc., Pasadena, Calif.
ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK. VOLUME V. DIRECT SOLAR CONVERSION,
by W. Evans and W. R. Menetrey. Sep 60, 1v. incl. illus. 56 refs. (EOS rept. no. 390-Final, vol. 5)
(Contract AF 33(616)6791, Proj. 4769)
(WADD TR 60-699, vol. 5) Unclassified report

DESCRIPTORS: *Solar cells, *Solar energy, *Power supplies, Direct current, Effectiveness, Meteorites, Space environmental conditions, Van Allen radiation belt, Mirrors, Generators, *Photoemission, *Handbooks, Space flight, Temperature control, Cooling, Geometry, Design, *Photoelectric cells, Plasma physics, Electromagnetic waves, Theory, Materials, Cratering, Configuration, Production.

The performance characteristics are described of the photovoltaic converter when used to convert solar radiation directly to dc electrical energy. Empirical and analytical relationships are derived which present expected efficiencies of conversion as a function of temperature, solar insolance, and other factors. The effects of environmental degradation due to meteoroids and the Van Allen belts are discussed. The present and anticipated state-of-the-art of fabrication techniques is presented, along with the advantages of using concentrating mechanisms for increasing the solar illumination level. A discussion is also included describing the state of the art and practical and theoretical limitations of the photo-emissive generator. It does not appear at present that the photo-emissive generator offers competition to the photovoltaic cell. (Author)

AD-257 795 Div. 7, 1
(15 June 61) OTS price $2.60

Naval Research Lab., Washington, D. C.
A METHOD OF ESTABLISHING THE BEST VOLTAGE LEVELS FOR FUTURE NAVAL AIRCRAFT,
by J. P. O'Connor. Final rept. 16 May 61, 18p. incl. illus. tables, 19 refs. (NRL rept. no. 5611)
Unclassified report

DESCRIPTORS: Aircraft equipment, Airplanes, Airborne, *Naval aircraft, *Electrical equipment, Reliability, *Voltage, Transmission lines, Load distribution, Electric wire, *Electric cables, Copper wire.

Reliability is of paramount importance in aircraft electrical systems. With higher system voltages the problems of corona, arc-over, and adaptation of utilization equipment become increasingly difficult, especially in high-altitude applications. It is shown that if the criterion of maximum utilization of copper or other conductor in the transmission system is used to establish the optimum system voltage, the weight of wiring in the transmission system is reduced to within 5% to 10% of the theoretical minimum with only a moderate increase (50%) in present system voltages. A simple method was evolved to determine the variation of system wiring weight and other system parameters with increase in system voltage. The method is applicable to any system, dc or ac, and to any aircraft. Application of the method to the dc and ac transmission systems on the WF-2 aircraft indicates that a weight reduction of 30% in system wiring will result with an increase of approximately 50% in systems voltage. On application of the analysis to several representative naval aircraft, best system voltage levels for future aircraft can be determined. (Author)

AD-257 828 Div. 7, 8
(16 June 61) OTS price $8.10

Temco Electronics, Dallas, Tex.
INVESTIGATION OF SILICON CONTROLLED RECTIFIERS FOR STATIC POWER CONVERSION,
by G. P. Underbrink. Quarterly progress rept. no. 1, 1 July-30 Sep 60, 20 Feb 61, 1v. incl. illus. tables, 13 refs. (Rept. no. TER 611.1901-A)
(Contract DA 36-039-sc-85381)
Unclassified report

DESCRIPTORS: *Rectifiers, Semiconductors, Transistors, Electrical equipment, Electric currents, Design, Wave analysis, Fourier analysis, Silicon, Theory, Electrical properties.

An investigation was made of an area of general research concerned with the application of the silicon controlled rectifier (SCR) to high power conversion. Fundamental concepts of static power conversion are established and problem areas associated with the SCR are treated. Background information leading to requirements for semiconductor static power converters and increasing demands for implementation of the silicon controlled rectifier in this field are pointed out. A general description of the SCR is given and terminology, important properties, and operating characteristics are listed. The fundamental methods for dc-ac power conversion have been categorized into three types: (1) series, (2) parallel, and (3) bridge. Each of these methods is described listing pertinent considerations related to silicon controlled rectifier usage. This summary description contains mathematical expressions for load, voltage, and frequency regulation, as well as efficiency. Derivations of these expressions are appended. (Author)

AD-257 855 Div. 7, 22, 25
(20 June 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
THEORY OF AN ELECTROMAGNETIC MASS ACCELERATOR FOR ACHIEVING HYPERVELOCITIES,
by Karlheinz Thom and Joseph Norwood, Jr.
June 61, 36p. incl. illus. (Technical note no. D-886)

Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-886.

DESCRIPTORS: *Hypervelocity guns, Velocity, *Hypervelocity projectiles, Electromagnetic fields, Projectiles, Electromagnetism, Heat transfer, Acceleration, *Electric guns, *Ballistics, Interior ballistics, Design.

It is shown that for any electromagnetic accelerator which employs an electromagnetic force for driving the projectile and uses the projectile as the heat sink for the energy dissipated in it by ohmic heating, the maximum velocity attainable without melting is a function of the mass of the projectile. Therefore, for hypervelocities a large projectile mass is required and thus a power supply of very large capacity is necessary. It is shown that the only means for reducing the power requirement is maximizing the gradient of the mutual inductance. In the scheme of the sliding-coil accelerator investigated herein, the gradient of the mutual inductance is continuously maintained at a high value. It is also shown that for minimum length of the accelerator, the current must be kept constant despite the rise in induced voltage during acceleration. The use of a capacitor bank as an energy source with the condition that the current be kept constant is investigated. Experiments at low velocities are described. (Author)

AD-257 898 Div. 7, 4
(20 June 61) OTS price $4.00

Sundstrand Aviation-Denver, Pacoima, Calif.
A NITROSYL CHLORIDE SOLAR REGENERATIVE FUEL CELL SYSTEM,
by W. E. McKee, E. Findl and others. Rept. for Apr 59-Oct 60. Oct 60, 263p. incl. illus. tables, 38 refs. (Rept. no. S/TD 1868)
(Contract AF 33(616)6585, Proj. 3145)
(WADD TR 60-821, pt. 1) Unclassified report

DESCRIPTORS: *Fuel cells, Design, *Nitrogen compounds, Oxychlorides, Solar energy, Dissociation, Light, Chlorine, Oxides, Photochemical reactions, Photochemistry, Electrochemistry, Photolysis.

The development of the nitrosyl chloride solar regenerative fuel cell system was undertaken. A preliminary model specification was written for a 10 cell, 1.5 v experimental breadboard model whose power goal is 6 watts output. Fabrication of this model is discussed. Regeneration is accomplished by using light to dissociate gaseous nitrosyl chloride into nitric oxide and Cl. Usable amounts of this nitric oxide have been separated and spectrophotometrically identified for the first time. A new fuel cell operating on nitric oxide and Cl is described. The theoretical cell voltage of 0.21 v was obtained, but problems of electrode flooding and polarization have thus far limited current output to low values. A preliminary study of a future 500-w flight type solar regenerative fuel cell system of advanced design is presented in the appendix. Flight systems of over 5 kw will probably be excessively heavy, but ground based systems of over 10 kw, employing techniques used in the breadboard model, should be possible. (Author)

AD-257 908 Div. 7, 25
(22 June 61) OTS price $3.60

Science and Tech. Section, Air Information Div., Washington, D. C.
MANGANESE OXIDE THERMISTORS. SPECIAL TRANSLATION.
11 May 61, 31p. incl. illus. tables, 12 refs. (AID rept. 61-64, Trans. from Physicochemical Properties of Thermistors Made of Manganese Oxides; Akademiya Nauk SSSR. Energeticheskiy Institut Imeni G. M. Krzhizhanovskogo. Problemy Energetiki (Problems of Energetics) Moskva:pp. 828-848, 1959)

Unclassified report

DESCRIPTORS: *Thermistors, *Manganese compounds, Oxides, Dioxides, Resistance, Temperature, Pressure, Electrolytes, Polarization, Hall effect, Heat transfer, Mathematical analysis, Thermoelectricity, Electrical conductance, Oxygen, Ions, Adsorption, Gas diffusion, Electric currents, Electrical properties, *Semiconductors, Theory, Test equipment, Solid state physics, USSR.

Experimental investigation of the electrical and thermal properties of thermistors made on manganese oxides confirms the correctness of the hypothesis which states that the investigated specimens are actually solid electrolytes. Theoretical formulas are derived for the temperature dependence of the coefficient of heat conductivity and thermal emf. Empirical laws are determined to characterize the dependence of the resistance of specimens on temperature, and the dependence of the charge-carrier mobility in the specimens on activation energy. In thermistors made of manganese oxides, O ions, which are the charge carriers, also take an active part in the process of heat transport. In the presence of a temperature gradient in a thermistor semiconducting substance, a nonuniform concentration of O ions appears which leads to the appearance of an emf in the thermistor. (Author)

AD-257 977 Div. 7, 8
(23 June 61) OTS price $3.60

Kidde Aero-Space Div., Walter Kidde and Co., Inc., Clifton, N. J.
GENERAL USAGE FUNCTIONAL ASSEMBLIES.
Interim development rept. 1 July-30 Sep 60. 28 Nov 60, 30p. incl. illus. tables.
(Contract NObsr-81323)

Unclassified report

DESCRIPTORS: *Semiconductors, *Filaments, Direct current, Voltage, Capacitors, Resistors, Silicon, *Electronic circuits, Diodes, *Transistors, *Power supplies, Design, Tests, Oscillators.

Research is concerned with the design and development of a family of regulated filament supplies utilizing semiconductor electronics.

Division 7 - ELECTRICAL EQUIPMENT

A breadboard representative of the family of filament supplies was constructed and preliminary tests show the basic design to be capable of meeting the specified requirements. A breadboard representative of the family of high voltage supplies was also constructed. Initial measurements on a preliminary breadboard of the 6.3 v, 20 amp class of regulated filament supplies show that a + or - 1/3% variation in true rms output voltage is obtainable over the entire line-load continuum of 105 to 125 v line variation and 2.5 to 20 amp load variation. The work in the high voltage supplies consists of the breadboarding of a 1000 v dc regulated supply based on a class C oscillator. The low voltage level of 1000 v was chosen for prototype tests to alleviate the problems of arcing and insulation breakdown during initial circuit feasibility tests. (Author)

AD-258 075 Div. 7, 25
(20 June 61) OTS price $1.60

Honeywell Research Center, Hopkins, Minn.
DEVELOPMENT OF A SEMICONDUCTOR FILM-TYPE THERMOCOUPLE ENERGY CONVERTER.
Quarterly technical rept. no. 6, 1 Jan-1 Apr 61. 1 Apr 61, 17p. incl. illus.
(Contract DA 11-022-501-ORD-3230, Proj. TN2-8106)
Unclassified report

DESCRIPTORS: *Semiconductors, *Thermocouples, *Thermoelectricity, Generators, Resistance, Oxides, Voltage, Nickel compounds, Design, Flame spraying, Temperature, Power supplies, Manufacturing methods, Electrical properties, Tests.

An oxide thermoelectric generator was constructed. The properties of this generator are described. The unit establishes the usefulness of oxide thermoelectrics in applications where voltage at low current levels is required. (Author)

AD-258 078 Div. 7, 8
(3 July 61) OTS price $5.60

International Resistance Co., Philadelphia, Pa.
RESISTORS, FIXED FILM TYPE GENERAL PURPOSE,
by William F. Ebling and Jerome G. Burns. Quarterly progress rept. no. 5, 1 July-30 Sep 60. 30 Sep 60, 52p. incl. illus. tables.
(Contract DA 36-039-sc-81283)
Unclassified report

DESCRIPTORS: *Fixed resistors, *Resistors, Manufacturing methods, Production, Films, Carbon, Deposits.

Evaluation of low-range units indicates that filament treatment may improve the performance of these units. Experiments to reduce the cure time for contact paints continued, and a new CP was formulated based on an epoxy novalac resin. Results of experiments on overcoat development indicate that 528-13 is a satisfactory replacement for 460-75, which is no longer available. Evaluation of various molding compounds shows that DAP-5201 provides best over-all performance. All mechanical components of the filament machine and filament cutter have been completed and installed. A second lead-spinning and spray station is being added to the overcoating machine. The sub-assembly machine has been installed and samples are being run. The mold press has been completed except for a repair part in the pump. The trim-paint machine has been installed. Performance and reliability data was obtained on the 300 ohm, 9K ohm, and 0.24 megohm resistors. (Author)

AD-258 131 Div. 7, 8, 25
(19 June 61) OTS price $4.60

David Sarnoff Research Center, Princeton, N. J.
SEMICONDUCTOR PHOTOVOLTAIC CONVERSION,
by J. J. Wysocki, B. Goldstein and others. Triannual rept. no. 1, 1 Nov 60-28 Feb 61. 31 Mar 61, 37p. incl. illus tables.
(Contract DA 36-039-sc-87417, Proj. 3A99-21-001)
Unclassified report

DESCRIPTORS: *Semiconductors, *Solar cells, Silicon, Gallium compounds, Arsenides, Radiation damage, High temperature research, Alloys, *Power supplies, Phosphides, Thin films, Diffusion, Growth, Design, Resistance, Intermetallic compounds, Photons, Conductivity.

Research is concerned with the utilization of semiconductor alloys for the possible improvement of solar cell characteristics such as efficiency, high-temperature performance and radiation resistance. The question of the radiation-resistant properties of solar cells, especially those made of silicon and GaAs will also be considered. The solution-growth technique for fabricating GaAs solar cells and its limitations are discussed. The best cell made by this method had an efficiency of 2%. Preliminary work on hetero junctions and cells made from GaAs alloys is reported. Johnson's data for the solar irradiance (J. Meteorol. 11:431, 1954) was converted to yield the number of available photons outside the earth's atmosphere. The fabrication of oxygen-free Si n on p cells is discussed. The study of bulk conductivity changes as a result of electron bombardment indicate some change in an n-type Si blank with 2.7 ohm/cm resistivity for electron energies as low as 185 kev. (Author)

AD-258 202 Div. 7
(22 June 61) OTS price $1.10

Union Carbide Consumer Products Co.,
Parma, Ohio.
FEASIBILITY STUDY ON HIGH PERFORMANCE, SHORT DURATION POWER BATTERIES. APPENDIX III. CELL PREPARATION AND TESTING PROCEDURE.
Quarterly technical progress rept. no. 11, 15 Dec 60-15 Mar 61, 15 Mar 61, 6p. incl. illus.
(Appendix 3 to AD-254 151)
(Contract NOrd-18240)
Unclassified report

DESCRIPTORS: *Primary bateries, Design, Materials, Cathodes (Electrolytic cells), Salts, Melting, Electrolytes, Phosphates, Sulfates, Power supplies, Potentiometers, Electric potential, Diffusion, Polarization, Electrochemistry, Reduction.

AD-258 329 Div. 7
(23 June 61) OTS price $2.60

Aberdeen Proving Ground, Md.
ENVIRONMENTAL TEST OF NICKEL-CADMIUM STORAGE BATTERIES,
by L. W. Kenyon. June 61, 1v. incl. tables (Rept. no. DPS/OTA-42)
Unclassified report

DESCRIPTORS: *Alkaline cells, *Storage batteries, Nickel, Cadmium, Desert tests, Tests, Design, Climatic factors.

Environmental tests of ten 2HN and ten 6TN type nickel-cadmium batteries were conducted while installed in test and facility vehicles operated over various types of terrain at Yuma Test Station, Yuma, Arizona. Cell vent release plugs failed to function at prescribed pressures resulting in cell failures in all the batteries. It is recommended the durability of the nickel-cadmium battery be considered satisfactory when the deficiencies in the cell vent plug are corrected and that the configuration of future batteries be improved to make them more compatible with the battery boxes of existing ordnance vehicles. (Author)

AD-258 339 Div. 7
(7? ne 61) OTS price $6.60

Kin Tel Cohu Electronics, Inc., San Diego, Calif.
STANDARD REGULATED POWER SUPPLY.
Final development rept. on Task I, 8 May-8 Oct 60. 8 Oct 60, 65p. incl. illus. tables.
(Contract NObsr-81132, continuation of Contract NObsr-72758)

Unclassified report

DESCRIPTORS: *Power supplies, Shipborne, Direct current, Power transformers, Rectifiers, Voltage regulator tubes, Voltage regulators, Capacitors, Tests, Design, Construction, Electrical engineering, Electrical equipment, Reliability, Power amplifiers.

Technical procedures are described which were employed in the basic design of a proposed family of standard regulated DC power supplies. Results of studies on the power transformer, the rectifier unit, the series regulator tube, the control amplifier and the output capacitor, are discussed. In addition to the individual unit studies, a detailed discussion of the 300 volt, 300 milliampere member of the power supply family is presented. Initial environmental tests (including vibration, temperature, humidity, shock, and salt spray) are described. Design of the complete family of regulated power supplies is discussed. This discussion includes electrical design variations between individual members of the family. Mechanical construction methods are also covered. Included are unique problems found in modular construction. (Author)

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-257 622 Div. 8, 5
(14 June 61) OTS price $4.60

Space Technology Labs., Inc., Los Angeles, Calif.
INJECTION LOCKING OF KLYSTRON OSCILLATORS,
by Richard C. Mackey. 15 Mar 61, 44p. incl. illus. 21 refs. (Rept. no. 7216-0001-NU-000)
(Contract AF 04(647)619)
(AFBMD TN 61-15) Unclassified report

DESCRIPTORS: *Microwave oscillators, Tests, Design, Electron tubes, Transients, Phase modulation, Mathematical analysis, Feedback amplifiers, Frequency multipliers, Phase shifters, Phase detectors, Phase studies, X-band, Secret communication systems, *Reflex klystrons, Microwave amplifiers, Oscillator circuits, Oscillators, *Klystrons.

Research was concerned with the useful applications of synchronization phenomena. In order to take advantage of amplification by synchronization, a laboratory investigation of the locking phenomena of reflex klystrons was undertaken in connection with the secure communications phase of the AGS program. If certain criteria are met, a microwave oscillator may be synchronized by the injection of a controlling signal into the oscillator cavity. Locking was observed with injection signals 70 db below the oscillator output and 30 db ratios were demonstrated to be easily realizable. Injection locking is a form of amplification that takes advantage of the greater efficiency and availability of oscillator devices in the microwave region of the frequency spectrum. Experimental verification of the theory is shown for 180 degree phase modulation of the locking signal at rates up to 100 kc. (Author)

AD-257 696 Div. 8, 15
(14 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PROPAGATION OF A WAVE FRONT IN A DISPERSED MEDIUM,
by K. M. Stepanov. 13 Feb 61. 6p. (Trans. no. MCL-726 from Dopovidi Akademii Nauk Ukrains-koy RSR 1:63-66, 1955)
Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Propagation, Mathematical analysis, Partial differential equation, Vector analysis, USSR.

AD-257 714 Div. 8
(15 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON THE PROBLEM OF DIFFRACTION OF RADIO WAVES OVER THE NONUNIFORM SPHERICAL SURFACE OF THE EARTH,
by Yu. K. Kalinin. 16 Feb 61. 6p. (Trans. no. FTS-9857 from Radiotekhnika I Elektronika 3:1274-1279, 1958)
Unclassified report

DESCRIPTORS: *Radio waves, *Wave transmission, Earth, Surface properties, Propagation, *Diffraction, Integral equations, Mathematical analysis, USSR.

AD-257 736 Div. 8, 25
(16 June 61) OTS price $9.10

Colorado U., Boulder.
MILLIMETER WAVE TRANSITIONS FOR FREQUENCY CONTROL,
by Frank Barnes, Donald Burkhard, and Masataka Mizushima. Quarterly progress rept. no. 3, 11 Oct 60-10 Jan 61. 10 Jan 61, 96p. incl. illus. table.
(Contract DA 36-039-sc-85313, Proj. 3A-99-15-001-03)
Unclassified report

DESCRIPTORS: Microwave frequency, *Microwaves, *Frequency stabilizers, Standards, Molecules, Physical properties, Theory, Electric fields, Magnetic fields, *Molecular rotation, *Molecular beams, Deflection, Signal-to-noise ratio, Perturbation theory, Detectors, Resonance, Design, Mathematical analysis, Alkali metal compounds, Sodium compounds, Hydrides, Hydrogen compounds, Sulfides, Matrix algebra.

The general theory for a diatomic molecule was summarized and the expression was derived for the shift of the energy levels in the presence of a crossed electric and magnetic field. Energy level diagrams for the Stark effect in D2O are presented. The available data on the Zeeman Effect in H2S is summarized and additional data on the eigen values for asymmetric top rotators are tabulated. Some effects of the beam goemetry and the deflection system on the signal-to-noise ratio of a beam machine are discussed to indicate the importance of various parameters on a figure of merit. (Author)

AD-257 748 Div. 8
(16 June 61) OTS price $3.60

Illinois U., Urbana.
AVALANCHE TRANSISTOR CIRCUITS,
by W. Michael Henebry. May 61, 14p. illus. table
(Technical rept. no. 23)
(Contract Nonr-183405)
Unclassified report

DESCRIPTORS: *Transistors, *Electronic circuits, *Switching circuits, Counting methods, Diodes, Semiconductors, Gemanium, Pulse generators, Test equipment, Electronic switches, Reliability.

Avalanche transistor circuits offer several features which are desirable in fast counting systems; (1) simplicity, (2) versatility, (3) fast response, and (4) large charge gain. The investigation was concerned with the evolution of avalanche circuits which retain the desirable features but which do not suffer from the two defects of the basic avalanche circuit, low duty cycle, and a pulse propagation delay which is non-linearly dependent upon input. Several transistor types which are suitable for fast avalanche circuits are compared and comments are made about the application of these transistors. Described also are several useful circuits which may be constructed with avalanche transistor techniques. (Author)

AD-257 763 Div. 8, 7, 25
(16 June 61) OTS price $2.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
GENERALIZATION OF THE FREQUENCY-POWER FORMULAS

OF MANLEY AND ROWE,
by Paul Penfield, Jr. June 60, 1v.
(Contract AF 33(616)3984)

Unclassified report

Presented at the Symposium on Active Networks and Feedback Systems, Polytechnic Inst. of Brooklyn, 19-21 Apr 1960.

DESCRIPTORS: *Symposia, *Feedback, Non-linear systems, Capacitors, Power, Energy, *Circuits, *Electrical networks, Mathematical analysis, Frequency, Frequency converters.

Physical systems which obey the Manley-Rowe frequency-power formulas are studied. The frequency-power formulas of Manley and Rowe (Proc. IRE, 44:904-913, 1956) form a set of conservation principles that apply to nonlinear (or time-varying) energy-storage elements when used as frequency converters. They are conservation principles in the sense that they prescribe fundamental relations that are more or less independent of the details of the excitation, or of the device used. The term frequency converter is meant to include systems in which there is any interaction between power at various frequencies, whether or not the purpose is to obtain an output at a frequency different from the input. Losslessness is neither a necessary nor a sufficient condition. Systems characterized by a (possibly explicitly time-varying) energy state function, such as the Lagrangian, Hamiltonian, internal energy, or co-energy, obey the formulas. Distributed systems described by Hamilton's principle obey the formulas in such a way that the powers can be evaluated at the boundaries of the systems. The formulas thus relate quantities of engineering interest: the powers through the ports. Such distributed systems include nonlinear electromagnetic media, ferrites, electron beams, and acoustic fields. (Author)

AD-257 781 Div. 8
(16 June 61) OTS price $2.60

Institute of Mathematical Sciences, New York U., N. Y.
DIFFRACTION BY A SEMI-INFINITE SCREEN WITH A ROUNDED END,
by Demetrios G. Magiros and Joseph B. Keller.
Mar 61, 1v. incl. illus. (Research rept. no. EM-167)
(Contract AF 19(604)5238)
(AFCRL-156)

Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Diffraction, Cylindrical bodies, Electromagnetic fields, Propagation, Functions, Integral equations.

The diffraction of a cylindrical wave by a perfectly conducting semi-infinite thin screen with a cylindrical tip is analyzed. Three different methods are employed to find the field: the geometrical theory of diffraction, an expansion in radial eigenfunctions and the Watson transformation of the angular eigenfunction expansion. The latter two methods yield the same result, which proves that the solution can be expanded in radial eigenfunctions even though they are not complete. The asymptotic form of the solution for large ka coincides precisely with the result given by the geometrical theory of diffraction. Here k equals 2 pi/lambda is the propagation constant of the field and a is the radius of the tip. This agreement proves that the geometrical theory is correct for this problem. The result determines how the field in the shadow depends upon the wavelength and the curvature of the shadow forming object. (Author)

AD-257 809 Div. 8, 5, 6
(16 June 61) OTS price $2.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
DESIGN OF MILLIMETER WAVEGUIDE COMPONENTS,
by John W. E. Griemsmann. Quarterly rept. no. 3, 1 Dec 60-28 Feb 61, 3 Apr 61, 25p. incl. illus. table (Rept. no. PIBMRI-875.9-61)
(Contract DA 36-039-sc-85321)

Unclassified report

DESCRIPTORS: *Waveguides, *Transmission lines, Extremely high frequency, Radar equipment, Countermeasures, Secret communication systems, Microwave equipment, Measurement, Impedance, Standing wave ratios, Ferrites, Electronic circuits, Scattering, Tests, *Test sets, Transducers, Reflection, Microwaves, Dielectrics, Mathematical analysis, Design.

Research was continued to advance the state of the art in the field of passive type millimeter wave transmission line components applicable for current and future systems in the millimeter wave range extending from approximately 30 to 100 kmc (10 to 3 mm wavelength). Measurements on H-guide were made to determine: (1) the performance characteristics of newly fabricated shaped mode launchers, (2) the effect of flange separation on transmission characteristics, and (3) the effect of an angular separation between launching horn and H-guide. Also reported is a later series of measurements on H-guide mode launchers using a termination in H-guide specially designed to absorb a number of modes. Three devices proposed for impedance and V.S.W.R. measurements in H-guide are described. Further investigation is reported in the analysis of the scattering matrix of lossless single mode and multimode regions containing small ferrite bodies. Also described is an analysis applied to a ferrite ellipsoid in a single mode rectangular guide using a small obstacle technique. (Author)

AD-257 811 Div. 8, 26
(15 June 61) OTS price $3.60

Radio Corp. of America, Somerville, N. J.
70 MC, 1 WATT, SILICON TRANSISTOR,
by W. J. Freeman, III. Quarterly rept. no. 7, 5 Dec 60-5 Mar 61, 26p. incl. illus. tables.
(Contract DA 36-039-sc-81285)

Unclassified report

DESCRIPTORS: *Transistors, Silicon, Very high frequency, *Manufacturing methods, Silicon coatings, Dioxides, Production, *Transistor amplifiers, Radiofrequency amplifiers, *Oscillators, Radiofrequency oscillators, Design, Test methods, Tests, Life expectancy, Processing, High temperature research, Failure (Mechanics), Storage.

Investigations were continued in the development of a manufacturing process to develop a production line for a 70 mc, 1 watt silicon transistor. The planar-constructed preproduction samples were fabricated and the results of some of the testing were analyzed. Additional life test storage data for 3000 hours from the first group of planar transistors showed the desirability of this design. Illustrations showing the change of testing requirements with various parameters are presented for the planar device. An interesting effect was observed during the initial stages of planar construction. When the transistor junctions were reversed biased at collector currents of approximately 50 ma, the junctions broke down and pinpoints of light were observed along the base-collector and base-emitter junctions. (Author)

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-257 825 Div. 8, 20
(16 June 61) OTS price $5.60

SFD Labs., Inc., Union, N. J.
THE LARMOTRON. A DC PUMPED QUADRUPOLE AMPLIFIER,
by George Bernstein and Joseph Feinstein.
Interim rept. no. 1, June 61, 52p. incl. illus.
(Contract AF 33(616)8030, Proj. 1670-4156)
Unclassified report

DESCRIPTORS: *Amplifiers, Theory, Tests, Antenna couplers, Design, Analysis, Velocity, *Electron beams, Noise, Electron guns, Applied mechanics, *Microwave amplifiers, X-band, Magnetic fields, Mathematical analysis, Phase modulation, Reduction.

A two-phase theoretical and experimental investigation of the Larmotron microwave amplifier is described. The Larmotron is a dc pumped quadrupole amplifier which uses transverse deflection RF couplers. The first phase is concerned with the realization of a Larmotron amplifier at an operating frequency of 70 kMc. The objective is to achieve a CW power output of 10 watts over a 5% bandwidth. The results of cold test design work on the RF couplers are described and experimental data given. The coupler uses a slow-wave circuit called the spiral-staircase structure which has been developed for use with the Larmotron amplifier. Two new electron guns are being built for use with this tube. Pertinent problems of beam control are discussed. Phase II is concerned with an investigation of the noise reduction mechanisms inherent in the Larmotron. The object is the design of a low noise amplifier in the X-band frequency range. A theoretical analysis is given of the unique requirements on the coupler, if it is to be used with dc pumped quadrupole structures, to produce a low noise amplifier. (Author)

AD-257 829 Div. 8, 26
(15 June 61) OTS price $6.60

Western Electric Co., Winston-Salem, N. C.
INDUSTRIAL PREPAREDNESS STUDY. LACQUER FILM CAPACITORS,
by H. E. Lloyd. Quarterly progress rept. no. 9, 25 Feb-25 May 61. 25 May 61, 59p. incl. illus. tables.
(Contract DA 36-039-sc-81268)
Unclassified report

DESCRIPTORS: *Capacitors, Films, Thin films, Coatings, Varnishes, Manufacturing methods, Production, Quality control, Tests, Cellulose acetates, Aluminum coatings, Encapsulation, Metal coatings, Resistance, Dielectric films, Electric insulation, Paper, Plastic coatings.

Effort has been directed primarily toward improvements in the quality of the lacquer film capacitors. Difficulties experienced with deterioration of insulation resistance and effective series resistance upon the application of heat have been resolved. Also, excessive capacitance growth has been brought under control. Data were presented to show the present level of quality. Also, previously collected data is used to make comparisons with the current experience. Preproduction samples for the 1.0 and 0.1 microfarad sizes are undergoing electrical test. Samples for the 5.6 microfarad size are in an advanced stage of production. (Author)

AD-257 843 Div. 8, 2
(20 June 61) OTS price $14.00

Geophysics Corp. of America, Bedford, Mass.
GENERATION AND TRANSMISSION OF ELECTROMAGNETIC WAVES IN THE TERRESTRIAL ATMOSPHERE,
by P. J. Nawrocki and R. J. Papa. May 61, 200p. incl. illus. tables (GCA technical rept. no. 61-24-A; Scientific rept. no. 8)
(Contract AF 19(604)7405)
(AFCRL-307) Unclassified report

DESCRIPTORS: *Atmosphere, *Electromagnetic waves, *Wave transmission, Propagation, Bremsstrahlung, Cerenkov radiation, Blackbody radiation, Scattering, Electrons, Radiofrequency, Geophysics, Absorption, Terrestrial magnetism, Mathematical analysis.

Contents:
Generation
Classical Radiation fields
Cyclotron Radiation
Bremsstrahlung
Cerenkov Radiation
Spontaneous absorption and emission
Black body radiation
Plasma radiation
Transmission of electromagnetic waves in the terrestrial atmosphere
Ultra-violet
Infra-red
The microwave region
Meter (UHV), decameter (VHF). and hectometer (HF)
LF, VLF, ELF, and MHD waves
Ray tracing
Scattering of electromagnetic waves
Collision frequencies of electrons
Cross modulation
RF breakdown

AD-257 933 Div. 8, 2, 25
(21 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
REFLECTION OF ELECTROMAGNETIC WAVES FROM THE SUN, MOON, AND PLANETS.
Background rept. for Jan 58-Jan 60. 19 May 61, 7p. (AID rept. 61-78).
Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Reflection, Sun, Moon, *Planets, Radar tracking, Radar reflections, Aurorae, Polarization, Cosmic rays, *Wave transmission.

AD-257 941 Div. 8, 5
(21 June 61) OTS price $6.60

Stanford Electronics Labs., Stanford U., Calif.
APPLICATION OF THE POTENTIAL ANALOGY TO BODE'S LINEAR-PHASE FILTER DESIGN,
by E. H. Luthman. 26 May 61, 61p. incl. illus. tables, 12 refs. (Technical rept. no. 097-1)
(Contract Nonr-22524, Proj. NR 373 360)
Unclassified report

DESCRIPTORS: Synthesis, *Video networks, *Video filters, Television equipment, *Radiofrequency filters, Mathematical analysis, Design, Tests, *Phase shifters, Attenuation, *Band-pass filters, Functions.

The design of linear-phase filters has assumed a role of increasing importance to the network synthesizer. Research is concerned with the design techniques for such filters by investigating the possibility of applying the potential analogy to

Bode's well-known method of parameter determination for linear-phase filters. The potential analogy is applied to 2 typical Bode filters: the first has 3 critical frequencies in the transmission band and one in the transition region, while the second has 5 critical frequencies in the transmission band and 1 in the transition region. Flux plots for a negatively charged plate lying in the passband region of the frequency axis, and positive charges located in the finite p-plane, are drawn. The method of quantizing the negative charges on an equipotential is employed, from which a quantized image transfer function for each filter is obtained. The phase and attenuation characteristics of these transfer functions are studied and compared with similar characteristics of other linear-phase filter designs. Several realizing techniques are applied to these transfer functions and the resulting networks are shown. (Author)

AD-257 942 Div. 8
(20 June 61) OTS price $1.60

Stanford Electronics Labs., Stanford U., Calif.
STANFORD PAPERS AT 1961 INTERNATIONAL SOLID-STATE CIRCUITS CONFERENCE,
by H. D. Crane, J. F. Gibbons and others.
21 Apr 61, 9p. incl. illus. (Technical rept. no. 1507-2)
(Contracts Nonr-22524, Proj. NR 373 360 and Nonr-22531, Proj. NR 048 122)
Unclassified report

Paper presented at the 1961 International Solid State Circuits Conference at Philadelphia in Feb 1961.

DESCRIPTORS: *Symposia, Circuits, *Electronic circuits, *Transistors, *Switching circuits, Electronic switches, Electronics, Electronic equipment, *Transmission lines, Nonlinear systems, Wave transmission.

Contents:
The neuristor, by H. D. Crane
Supersaturated tranistor switches, by J. F. Gibbons
How can solid-state electronics mature without losing its youth, by J. G. Linvill
Analysis of a nonlinear transmission line, by R. B. Riley

AD-257 943 Div. 8, 7, 15
(21 June 61) OTS price $8.10

Stanford Electronics Labs., Stanford U., Calif.
THE USE OF WEIGHT FUNCTIONS IN THE TRANSIENT ANALYSIS OF NONLINEAR CIRCUITS,
by C. S. Yen. 8 June 61, 82p. incl. tables, 17 refs. (Technical rept. no. 2052-1)
(Contract Nonr-22524, Proj. NR 373 360)
Unclassified report

DESCRIPTORS: *Electrical networks, Circuits, *Electronic circuits, Differential equations, *Transients, Functions, Fourier analysis, Analysis, Mathematical analysis, *Resistors, Errors.

Light damping is described by a second-order differential equation for a nonlinear electric circuit. Using the principle of variation of parameters, a reduction is made of given equation to 2 first-order differential equations. A weight function method is applied to these 2 equations. The result of this analysis is presented by 2 transient-response curves. Three systems of equations are studied. For the first 2 systems, the results obtained are either better or comparable to those of Kryloff and Bogoliuboff's method. Some improvement of Kryloff and Bogoliuboff's method, using the results of the weight function method, is considered, and excellent results are obtained. The third system is an example of use of the undamped frequency in the assumed solution, which is a generalization of the Kryloff and Bogoliuboff method. For the single-term approximation, error increases with increasing nonlinearity due to the presence of higher harmonics. (Author)

AD-257 947 Div. 8
(19 June 61) OTS price $1.60

Watkins-Johnson Co., Palo Alto, Calif.
250-500 MC LOW-NOISE TRAVELING-WAVE TUBE AMPLIFIER,
by Robert E. Vehn. Quarterly technical rept. no. 4, Jan-Mar 61. 14 Apr 61, 16p. incl. illus. table.
(Contract AF 30(602)2200)
(RADC TN 61-92) Unclassified report

DESCRIPTORS: *Traveling wave tubes, Electron tubes, *Microwave amplifiers, Amplifiers, Helixes, Electron beams, Electron guns, Tests, Life expectancy, Design, Very high frequency, Ultra high frequency.

Results are presented of tests performed on 6 experimental tubes. Gains obtained were marginal being of the order of 20 to 23 db. Noise figure performance of 5 to 6 db indicated that gun parameters were not optimum. Tests employing a field peaker showed that for an 18% larger beam diameter, gain will increase by 6 to 8 db. A direct-pin match employing spread-turns of the helix and a two-section quarter-wave transformer resulted in an input match with VSWR less than or equal to 1.8:1 and insertion loss of a few tenths of a db. Cold attenuation in excess of 90 db was obtained with a lossy carbon film applied over a 2 3/4 inch length of the three ceramic helix support rods. Results of a life test program are summarized. Power complement design was completed and circuit breadboarding was initiated. (Author)

AD-257 948 Div. 8
(19 June 61) OTS price $1.60

Watkins-Johnson Co., Palo Alto, Calif.
DEVELOPMENT OF AN E-BAND AMPLIFIER,
by E. W. Kinaman and K. L. Kotzebue. Quarterly rept. no. 1, 14 Apr 61, 15p. incl. illus. (Technical rept. no. 1)
(Contract AF 30(602)2422, Proj. 5573)
(RADC TN 61-93) Unclassified report

DESCRIPTORS: Extremely high frequency, *Microwave amplifiers, Amplifiers, Radio-frequency filters, Yttrium compounds, Iron compounds, Garnet, *Traveling wave tubes, Ferromagnetic materials, Noise (Radio), Reduction, *Diodes, Test equipment, Design, *Band-pass filters, Magnets, Waveguide filters.

Research is concerned with the development of an E-band low-noise amplifier. The amplifier consists of an yttrium iron garnet tunable filter

followed by a low-noise traveling-wave tube providing a net 12 db maximum noise figure over the 70-85 kmc frequency range. The output power should be one milliwatt minimum, the gain 25 db minimum, the reverse attenuation 75 db minimum. The filter shall have a 200 mc bandwidth (3 db) and be tuned at a minimum 1000 cycles per second. In addition permanent magnet focusing will be utilized for the tube, if feasible. (Author)

AD-257 969 Div. 8, 25
(20 June 61) OTS price $3.60

Bell Telephone Labs., Inc., Whippany, N. J.
SOLID-STATE MASER RESEARCH,
by E. D. Reed. Quarterly progress rept. no. 3, 20 Dec 60-20 Mar 61. 20 Mar 61, 38p. incl. illus. tables.
(Contract DA 36-039-sc-85357, Proj. 3A-99-21-001)
Unclassified report

DESCRIPTORS: *Microwave amplifiers, Amplifiers, L band, Ruby, Magnetic fields, Gadolinium, Calcium compounds, Tungstates, Paramagnetic resonance, Lattices, Cobalt, Chemical impurities, Aluminum compounds, Oxides, Mathemtical analysis, Scientific research.

Research covers five different subjects in the field of solid state maser research; (1) a study of the optimum ruby orientation for traveling-wave maser applications, (2) an experimental program on a new maser material consisting of gadolinium in calcium tungstate (in particular the inherent gain of this material at low microwave frequencies is being studied), (3) an experimental study of broadening the effective ruby linewidth by shaping the applied dc magnetic field, (4) the continuation of a theoretical treatment of harmonic spin coupling, and (5) a study of paramagnetic resonance properties of cobalt-doped Al203. (Author)

AD-257 972 Div. 8, 25
(19 June 61) OTS price $1.60

Convair, San Diego, Calif.
THE MICROWAVE DIAGNOSIS OF A COLUMN OF IONIZED GAS,
by J. R. Barthel. May 61, 14p. incl. illus.
(Rept. no. ZPh-096)
(Contract DA 04-495-ORD-3112)
(ARPA Order no. 39-59, Task 2)
Unclassified report

DESCRIPTORS: Gas ionization, *Ionization, *Gases, Microwaves, *Electromagnetic waves, Scattering, Reflection, Refraction, Electromagnetic fields, *Propagation, Analysis.

The inverse scattering problem of deducing the structure of a column of ionized gas from its microwave scattering properties is solved for a homogeneous column and a column which is sufficiently dilute that the electrons may be assumed to be independent scatters. Criteria are presented which may be applied to experimental data to determine which of the above models (if either) is applicable. (Author)

AD-257 984 Div. 8, 5, 12
(19 June 61) OTS price $3.60

Delta-f, Inc., Geneva, Ill.
DEVELOPMENT OF A QUARTZ CRYSTAL OSCILLATOR FOR COMMUNICATIONS SATELLITES,
by H. E. Gruen and D. W. Scarborough, Jr. Quarterly rept. no. 2, 15 Jan-15 Apr 61. 15 Apr 61, 28p. incl. illus.
(Contract DA 36-039-sc-87366, Proj. 76-01-001-08)
(ARPA Order no. 54-60) Unclassified report

DESCRIPTORS: *Crystal oscillators, Quartz crystals, Oscillator circuits, Transistors, Very high frequency, *Satellite vehicles, Communication equipment, Radio transmitters, Design, Temperature control, Test equipment, Thermistors, Ovens, Packaging, Aging, Glass-textiles, Electric insulation.

A study made with a type 2N706A transistor yielded power levels less than the desired 100 mw. With the present configuration, efficiencies of 25 to 30% are realized at a power output level of 100 mw. A simplified proportional control system was developed which provides improved gain stability as a function of temperature. This design requires considerably less space than the initial control design, and incorporates a dc system utilizing a thermistor sensing element in a dc amplifier which in turn controls the current in a power transistor heater. Problems encountered with transistor placement are discussed as well as mechanical assembly of the entire package. (Author)

AD-257 985 Div. 8, 12, 22
(19 June 61) OTS price $7.60

Denver Research Inst., Colo.
TEST EQUIPMENT FOR AND EVALUATION OF ELECTROMAGNETIC RADIATION,
by R. C. Amme, D. E. Rugg, and J. E. Nunnally. Supplementary final rept. for 1 Dec 60-31 Mar 61. 31 Mar 61, 1v. incl. illus. tables.
(Contract N123(60530)10049A)
Unclassified report

DESCRIPTORS: *Electric igniters, Detectors, Thermal radiation, *Electromagnetic waves, Circuits, Electrical networks, Thin films, Electric bridges, *Thermocouples, Electric detonators, Heat transfer, Inductance, Heat, Measurement.

Results of calculation of transfer of heat from a Mk 1 squib bare bridge wire are presented with experimental verifications. Thin film substrate vacuum deposited thermocouples are described, and their use in conjunction with an electronic system which gives an overall response to a step function input of heat of about one millisecond is discussed. Measurements of thermocouple output versus thermocouple to bridge wire spacing for various values of dc bridge wire current are presented. (Author)

AD-257 986 Div. 8
(20 June 61) OTS price $8.10

Electronics Research Lab., U. of Calif., Berkeley.
BLOCK-DIAGRAM REPRESENTATION OF JUNCTION DIODES

AND TRANSISTORS,
by Georg Bruun. 28 Feb 61, 76p. incl. illus. 31 refs. (Rept. no. 120; Series no. 60, Issue no. 350)
(Contract Nonr-22274)
Unclassified report

DESCRIPTORS: *Electronic circuits, *Diodes, *Transistors, Electron tubes, Switching circuits, Semiconductors, Equations, Diffusion, Circuits, Amplifiers, Mixer tubes, Radio interference, Mathematical analysis, Analysis.

A block-diagram description is presented of junction diodes and transistors that facilitates the connection between the physics and the nonlinear circuitry. The block diagrams are of a simple type as they consist of nonlinear memoryless blocks and of linear-operator blocks. The diagrams assume that the diffusion equation is linear; this is not correct at large currents. The other nonlinearities in the device as given from the Boltzmann equation are however so pronounced that they will be dominating even in cases where the nonlinearity of the diffusion equation is significant. Nonlinear high-frequency circuit problems to which the block-diagram representation has proven useful are switching, amplifier cross modulation, mixer and class-C amplifier problems. (Author)

AD-257 993 Div. 8, 30
(19 June 61) OTS price $6.60

Georgia Inst. of Tech., Engineering Experiment Station, Atlanta.
VHF AND UHF CRYSTAL CONTROLLED OSCILLATORS,
by Samuel N. Witt, Jr. and Hugh W. Denny. Quarterly progress rept. no. 3, 1 Jan-31 Mar 61. 31 Mar 61, 60p. incl. illus. tables.
(Contract DA 36-039-sc-85048)
Unclassified report

DESCRIPTORS: Very high frequency, Ultra high frequency, *Crystal oscillators, Oscillators, Frequency stabilizers, Transistors, *Microwave amplifiers, Amplifiers, *Frequency multipliers, Instrumentation, Test equipment, Tests, Design, *Oscillator circuits, Measurement, Radiofrequency generators, Crystals.

Four VHF transistorized oscillator units are described. The detailed analyses of temperature and voltage effects on one of the units and typical short-term frequency variations of all of the units are discussed. Efforts were made to determine the causes of the observed short-term frequency variations. The oscillator units currently described operate in the frequency range from 100 to 225 mc. Seven VHF transistorized amplifiers are described with schematic diagrams and photographs. Power gains as great as 21 db were obtained. Six frequency multiplier units are also described. All of the units are designed to either double or triple the input frequency. Output frequencies as high as 450 mc are reported. Additional amplification was required between the transistorized oscillator units and the multipliers in most cases. The problems of instrumentation in the measurement of oscillator characteristics are discussed. (Author)

AD-257 997 Div. 8, 26
(20 June 61) OTS price $4.60

General Telephone and Electronics Labs., Inc., Bayside, N. Y.
STUDIES OF ELECTRON TUBE MATERIALS AND THERMIONIC EMISSION PROCESSES.
Scientific rept. no. 4, 1 Jan-31 Mar 61. 5 Apr 61, 1v. incl. illus. (Rept. no. TR60-704-104-204-208.9)
(Contract AF 19(604)7286)
(AFCRL-313)
Unclassified report

DESCRIPTORS: *Electron tubes, Materials, *Thermionic emission, Cathodes (Electron tubes), Nickel, Impurities, Diodes, Oxide cathodes, Mass spectrometers, Gases, Electron microscopy, Theory, Crystals, Design, Tungsten, Aluminum compounds, Barium, Oxides.

The development of a diode to study oxide cathodes in a high-purity ambient was continued. The dynamics of gas evolution during processing of an oxide cathode and the sources of the several gas components present in an operating diode were studied by techniques involving omegatron mass spectrometers. Studies will determine adequate processing methods and establish the reproducibility of the diodes used for thermionic emission measurements. The work was carried out with diodes having oxide-coated platinum-based cathodes and platinum anodes. Efforts were also directed toward the conception of a theoretical basis which would permit reconciliation of all the phenomena observed during the investigations with barium-coated polycrystalline nickel. An anti-parallactic, small-aperture photometer probe with an automatic adapter to accommodate varying tube screen curvatures was developed for measuring discrete values from the screen pattern. A 21-inch face dummy tube, containing all the essential and critical features of the final microscope tubes, was successfully heat-processed in the oven which was built to process sealed-off-type microscope tubes. (Author)

AD-257 999 Div. 8
(21 June 61) OTS price $2.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
108-MC PRECISION FREQUENCY GENERATOR,
by D. Schwab and H. D. Tanzman. Nov 60, 27p. incl. illus. tables (ASRDL Technical rept. no. 2166)
Unclassified report

DESCRIPTORS: *Radiofrequency generators, Very high frequency, Radiofrequency power, Power amplifiers, Frequency stabilizers, Quartz crystals, *Crystal oscillators, Microwave oscillators, *Microwave amplifiers, Frequency multipliers, Power supplies, Design, Tests, Test methods.

A system to supply a minimum of 10 watts, 108-mc signal with a frequency stability of 1 x 10 to the -9th power/sec for a period of thirty minutes is described. The system is housed in a standard relay rack and contains an ultra-precise 1-mc crystal oscillator, frequency multipliers, power amplifier, and power supplies. Test results indicate a frequency stability of 5 x 10 to the -10th power for a sampling period of 1 second in the interval of 30 minutes. The system is described completely and testing techniques are outlined. (Author)

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-258 025 Div. 8, 26
(21 June 61) OTS price $2.60

Chatham Electronics Div., Tung-Sol Electric, Inc., Livingston, N. J.
RUGGED, CERAMIC, MINIATURE HYDROGEN THYRATRON,
by John J. McArtney. Quarterly progress rept. no. 3, 1 Jan-30 Apr 61. 30 Apr 61, 22p. incl. illus.
(Contract DA 36-039-sc-85061)

Unclassified report

DESCRIPTORS: *Miniature electro tubes, Electron tubes, *Thyratrons, Ceramic materials, Hydrogen, Cathodes (Electron tubes), Anodes (Electron tubes), Tests, Life expectancy, Design, Reliability, Electron tube heaters, Manufacturing methods.

Life test data and test results are presented. The present cathode is sufficient for 500 hours life at 100 amperes peak current and 3.3 amperes R.M.S. Increasing the grid drive improved the fast firing properties of the tube considerably. Initial test results indicated the various tube structures excepting the cathode heater will withstand a 500 g shock requirement. (Author)

AD-258 030 Div. 8
(21 June 61) OTS price $8.60

Stanford Electronics Labs., Stanford U., Calif.
ELECTRON DEVICES RESEARCH.
Consolidated quarterly status rept. no. 17, 1 Jan-31 Mar 61. 31 Mar 61, 86p. incl. illus. table.
(Contracts DA 36-039-sc-73178, AF 33(616)6207, AF 19(604)5480, AF 49(638)660, Nonr-22540, Proj. NR 373-370, and Nonr-22524, Proj. NR 373-360)

Unclassified report

DESCRIPTORS: *Electron tubes, *Plasma physics, *Microwave amplifiers, Amplifiers, Microwave equipment, Electron guns, Electron beams, Backward-wave amplifiers, Noise (Radio), Radiofrequency filters, Ferromagnetic materials, Traveling wave tubes, Ion beams, Broadband, Scientific research.

The status of all unclassified electron devices research carried on by the Electron Devices Laboratory of the Stanford Electronics Laboratories is reported. (Author)

AD-258 036 Div. 8
(20 June 61) OTS price $1.60

Hughes Aircraft Co., Culver City, Calif.
TRAVELING-WAVE AMPLIFIER.
by B. A. Highstrete, A. L. Rousseau, and A. W. Scott. Quarterly progress rept. no. 3 and technical rept. no. 3, 1 Jan-29 Apr 61. 29 Apr 61, 15p. incl. illus. (Rept. no. 321-H)
(Contract DA 36-039-sc-78259)

Unclassified report

DESCRIPTORS: *Microwave amplifiers, S band, *Traveling wave tubes, Electron tubes, Amplifiers, Electron beams, Test equipment, Tests, Electron guns, Design.

The periodic-permanent-magnet-focused beam tester for the 250 kw, S-band, traveling-wave amplifier was tested electrically with good results. A beam transmission of 89% at the design perveance of 2.25 x 10 to the -6th power at 55 kv with 135 watts heater power was obtained. Extensive cold test measurements were made to obtain a satisfactory match into the output circuit section of the tube which has a period taper. Measurements were also made to investigate upper mode suppression schemes and to provide an optimum internal termination configuration. The first r-f tube was assembled and processed. No serious mechanical difficulties were encountered. (Author)

AD-258 037 Div. 8, 30
(21 June 61) OTS price $4.60

Hughes Aircraft Co., Culver City, Calif.
HF, VHF, AND UHF POWER AMPLIFIERS AND OSCILLATORS,
by J. T. Thompson. Quarterly progress rept. no. 2, 1 Dec 60-28 Feb 61. May 61, 44p. incl. illus.
(Contract DA 36-039-sc-85308)

Unclassified report

DESCRIPTORS: High frequency, Very high frequency, Ultra high frequency, *Power amplifiers, Amplifiers, *Oscillators, *Microwave oscillators, *Microwave amplifiers, Design, Transistors, *Transistor amplifiers, Electronic circuits, Test equipment, Measurement, *Test sets, Mathematical analysis, Instrumentation.

Three useful devices for measuring transistor parameters are described. The General Radio 1607A bridge appears to be the most useful over the greatest parameter and frequency range. The Hewlett Packard 803 admittance meter and the MC Jones directional coupler are adequately treated, considering usefulness and range extensions toward transistor measurements. To complete the investigation of instrumentation, results of an extensive survey that covered all manufacturers of high frequency measuring equipment is listed and the few instruments usable for transistor work in the HF, VHF, and UHF regions are described. Ideas are extended toward the development of a worksheet approach to the general problem of amplifier design. One segment of the worksheet approach, the collector efficiency, is treated in detail both from an ideal case and an actual case that requires a numerical solution. (Author)

AD-258 055 Div. 8, 15
(20 June 61) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
A GENERAL METHOD FOR CONTROLLING THE TIME AND FREQUENCY ENVELOPES OF FM SIGNALS,
by Evert N. Fowle. 5 June 61, 13p. incl. illus.
(Rept. no. 416-0008)
(Contract AF 19(604)7400)

Unclassified report

DESCRIPTORS: *Fourier analysis, Integral transforms, *Radar signals, *Radio signals, Phase measurement, Phase modulation, Frequency modulation, Equations, Mathematical analysis, Frequency.

Research was concerned with finding expressions for the phase characteristics, time and frequency, when the envelope of a time function and the modulus of its Fourier transform are given. The method applies when the product of the function's time duration and its frequency extent is large. The technique presented applies for arbitrary envelope functions, thus extending the previous technique which required that one envelope or the other be rectangular. (Author)

AD-258 076 Div. 8, 6, 13
(21 June 61) OTS price $3.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
DIVISION 7. ENGINEERING.
Quarterly progress rept. 15 Apr 61, 30p. incl. illus. tables.
(Contract AF 19(604)7400)
(AFESD TN 61-1010) Unclassified report

DESCRIPTORS: Radar equipment, Ball bearings, *Radar antennas, Antennas, *Radomes, Test equipment, *Search radar, Electron tubes, Rotating structures, Materials, Model tests, Radiometers, Mobile, Construction, Design, Radar tracking, Shock tubes, Heat exchangers, Tests.

GROUP 71: The Design Engineering Group has developed a number of small mechanical devices related to the high-power-tube program and to the Laboratory's mobile radiometer, but has spent most of its time on development of components for large antenna systems. Further progress has been made in a program to study metallurgical improvement of rolling element bearing components, and a summary is presented for a recently completed study of the support and rotation of large antenna systems. GROUP 75: The Construction Engineering Group's operations were primarily concerned with portions of the Reentry Physics Program, implementation of the Haystack Hill (Tyngsboro, Massachusetts) field site, construction of several heat exchanger systems, and design of modifications to the Millstone Hill Radar Observatory (Westford, Massachusetts). GROUP 76: The 150-foot-diameter metal space-frame radome for Haystack Hill is approaching its installation stage. Basic loading and deflection studies in proportionately sized thin paraboloidal shell antennas are progressing. The first phase of the TTR (Target Tracking Radar for the Nike-Zeus system) radome experimental feasibility study to provide preliminary data on optimum geometry has been completed. (Author)

AD-258 077 Div. 8, 26
(16 June 61) OTS price $1.60

Transitron Electronic Corp., Wakefield, Mass.
INDUSTRIAL PREPAREDNESS STUDY FOR DIFFUSED SEMICONDUCTOR DEVICES,
comp. by Joseph Sucharzewski. Quarterly rept. 1 Jan-31 Mar 61 on Devices 2, 14, 15, 16, and 20. 31 Mar 61, 12p.
(Contract DA 36-039-sc-72714)
Unclassified report

DESCRIPTORS: *Transistors, Silicon, *Semiconductors, Germanium, *Manufacturing methods, Production, Design, Reliability, Tests, Life expectancy, Standardization.

AD-258 135 Div. 8
(19 June 61) OTS price $1.60

Transistor Applications, Inc., Boston, Mass.
RESEARCH DIRECTED TOWARD THE STUDY OF LINEAR AMPLIFICATION USING SWITCHES,
by A. W. Carlson. Scientific rept, no. 4, 1 Mar-31 May 60. July 60, 6p. incl. illus.
(Contract AF 19(604)4089)
(AFCRL TN 60-1166) Unclassified report

DESCRIPTORS: *Transistors, *Electronic circuits, *Switching circuits, Electronic switches, Power amplifiers, Radiofrequency filters, Low pass filters, Pulse generators, Trigger circuits, Audiofrequency, Audio amplifiers, Design, Mathematical analysis, Pulse modulation.

Research is described on the use of switches as power amplifiers. The switch is controlled by a signal to produce a duration modulated pulse train which is then passed through a low pass filter to recover the amplified signal. The method is capable of high efficiency in conversion of d-c source power to signal power, the efficiency approaching 100% with lossless switches in the proper circuit. The distortion is low if the pulse repetition rate is sufficiently higher than the cut off frequency of the filter and if the signal modulating the pulse train falls in the filter pass band. (Author)

AD-258 138 Div. 8
(19 June 61) OTS price $1.60

Transistor Applications, Inc., Boston, Mass.
RESEARCH DIRECTED TOWARD THE STUDY, ANALYSIS AND DESIGN OF TRANSISTOR CIRCUITS,
by A. W. Carlson. Scientific rept. no. 5, 1 June-31 Aug 60. Apr 61, 11p. incl. illus.
(Contract AF 19(604)4089)
(AFCRL-318) Unclassified report

DESCRIPTORS: *Transistors, *Electronic circuits, Diodes, Impedance, Capacitors, *Switching circuits, Trigger circuits, Design, Mathematical analysis.

A 34 section non-linear line using reverse biased junction diodes for voltage dependent shunt capacitance was constructed. The line is to be used to investigate problems raised in interpreting the mathematical solution of the lossless, uniform, distributed non-linear line given in AD-238 929. A two transistor free running sawtooth generator having a linear portion and a rapid recycle is described. In one version of the circuit, one of the transistors performs as a blocking oscillator and as an emitter follower to give a low impedance output for the signal. A counter using a closed loop shift register having one inversion in the loop was investigated. This type of operation has advantages at high count rates and also gives a reduction in active elements. (Author)

AD-258 145 Div. 8, 26
(21 June 61) OTS price $2.60

Sylvania Electric Products, Inc., Woburn, Mass.
MICROMINIATURIZED PACKAGING OF 2N384 AND 2N697,
by L. Epstein, C. Lawrenson, and J. McManus. Quarterly rept. no. 2, 1 Jan-31 Mar 61. 28p. incl. illus. tables.
(Contract DA 36-039-sc-85377)
Unclassified report

DESCRIPTORS: *Transistors, Germanium, Silicon, Packaging, *Subminiature electronic equipment, Design, Reliability, Manufacturing methods, Production, Tests, Life expectancy.

A lot of germanium alloy devices similar to 2N384's were enclosed in a microminiature package. The samples passed all tests except 500 G 1 millisecond shock. Work was continued on the 0.265 in.-diam package. Weld yields after header mounting were consistently over 90% and averaged almost 95%. A lot of silicon mesa devices were also mounted in microminiature packages and representative samples were taken for evaluation.

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-258 200 Div. 8
(26 June 61) OTS price $4.60

David Sarnoff Research Center, Princeton, N. J.
MAXIMUM PACKING DENSITY OF NON-REDUNDANT SEMICONDUCTOR DEVICES,
by J. T. Wallmark and S. M. Marcus. Scientific rept. no. 1 on Investigations of Fundamental Limitations Determining the Ultimate Size of Microstructures. 31 Mar 61, 32p. illus. 18 refs.
(Contract AF 19(604)8040)
(AFCRL-134) Unclassified report

DESCRIPTORS: *Semiconductors, Electronic equipment, Packaging, *Packaged circuits, *Subminiature electronic equipment, Silicon, Computers, Electronic circuits, Materials, Cosmic rays, Ionization, *Radiation damage, Transistors, Diodes, Impurities, Crystals, Design.

It is shown that there exists an absolute upper limit to packing density of non-redundant semiconductor devices, whether integrated or non-integrated, based on fundamental physical phenomena such as statistical variations in impurity distribution, maximum resolution of semiconductor fabrication methods, power density and influence of cosmic rays. The influence of these phenomena falls into 2 categories, namely, failures that appear during the fabrication of the devices (impurity distribution, dividing operation) and failures that appear during use. The latter may be temporary failures (cosmic ray ionization, carrier fluctuations) or permanent failures (atomic displacements by cosmic rays, heat generation). (Author)

AD-258 219 Div. 8
(22 June 61) OTS price $2.60

Raytheon Co., Newton, Mass.
THE FEASIBILITY OF QUICK WARM-UP AND STABILIZATION OF HEATER-CATHODE TYPE RECEIVING TUBES,
by Norman E. Linson. Quarterly progress rept. no. 7, 1 July-30 Sep 60. 30 Sep 60, 17p. illus. table.
(Contract NObsr-77535)
Unclassified report

DESCRIPTORS: *Electron tubes, Electron tube heaters, *Triodes, Cathodes (Electron tubes), Manufacturing methods, Production, Nickel, Tungsten, Tests, Life expectancy, Stabilization, Temperature, Design, Ceramic materials.

Integral heater-cathode systems were incorporated in planar triodes for evaluation of the emission and cathode design. Thirty-five tubes were made and various faults were analyzed and where possible corrected. Etched nickel heaters were found to be unsuitable and tungsten heaters were used with good results. Current densities comparable with commercial tubes were obtained. Life test results were obtained, covering 500 hours at a stable current density of 50ma/sq cm with 200 volts on the plate and appropriate grid voltages. (Author)

AD-258 225 Div. 8, 5
(26 June 61) OTS price $5.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
NONLINEAR LEAST-SQUARES FILTERING AND FREQUENCY MODULATION,
by Arthur Dickson Hause. 25 Aug 60, 49p. 31 refs. (Technical rept. no. 371)
(Contract DA 36-039-sc-78108, Proj. 3-99-00-000)
Unclassified report

DESCRIPTORS: *Frequency modulation, Signal-to-noise ratio, Mathematical analysis, Algebra, Integral equations, *Radio communication systems, *Communications theory, *Communication systems, *Radiofrequency filters, Least squares method.

Investigation concerns the use of optimum nonlinear filtering for the recovery of messages from modulated signals in the presence of additive Gaussian noise. S/N, defined in a manner especially suited to nonlinear filtering, is taken as the measure of performance. This definition also provides a useful connection with the mean-square-error criterion. Each filter has a linear section and a nonlinear, memoryless section. Attention is focused primarily on the latter. A simplified review of important properties of the orthogonal polynomials employed by Wiener for representation of the nonlinear filter section is included; special emphasis is placed on the properties of Hermite polynomials because this is a cornerstone in the derivation of succeeding results. The low S/N performance of communication systems is shown to be related in a simple way to the structure of the optimum filter polynomial. The use of this nonlinear filter theory confirms the notion that conventional FM practice produces somewhat less than optimum reception at low S/N. This study indicates that the type of FM that has potentially the best performance in this range is narrow-band FM with a phase-synchronized carrier. Also, the proper use of amplitude information in the noisy FM signal improves performance moderately. (Author)

AD-258 228 Div. 8, 5, 16, 25, 30
(27 June 61) OTS price $8.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
(No title). Quarterly progress rept. no. 61, by J. B. Wiesner, G. G. Harvey, and H. J. Zimmermann, for period ending 15 Apr 61.
15 Apr 61, 275p. incl. illus. tables.
(Contract DA 36-039-sc-78108, Proj. 3-99-00-000)
Unclassified report

DESCRIPTORS: Electronics, *Plasma physics, *Magnetohydrodynamics, *Microwave spectroscopy, Nuclear magnetic resonance, Molecular beams, Modulation, *Communications theory, *Data processing systems, *Data transmission systems, *Acoustics, Speech transmission, *Biophysics, *Neurology, Physiology, Computers, Scientific research.

AD-258 230 Div. 8, 25
(23 June 61) OTS price $11.50

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
(No title)
Progress rept. no. 19, 15 Sep 60-31 Mar 61, 31 Mar 61. 1v. incl. illus. tables. (Rept. no. R-452.19-61)
(Contract AF 18(600)1505)
Unclassified report

DESCRIPTORS: *Microwaves, Electronics, Electromagnetism, Cerenkov radiation, *Plasma physics, *Solid state physics, Microwave networks, Ferrites, Electrical networks, Control, *Control systems, Computers, Digital systems, Cybernetics.

Contents:
Electromagnetics
Plasma electrophysics and electronics
Solid state and materials research
Microwave circuits
Network theory
Systems and control

AD-258 238 Div. 8
(23 June 61) OTS price $1.10

Radio Corp. of America, New York.
DEVELOPMENT OF A DISPLAY STORAGE TUBE TO BE USED AT HIGH TEMPERATURES,
by R. P. Stone. Monthly engineering rept. for May 61. 12 June 61. 2p.
(Contract NObsr-77644)
Unclassified report

DESCRIPTORS: *Storage tubes, Electron tubes, High temperature research, Display systems, Design, Tests, Vibration.

Further progress was made in the environmental test program. The tube is supported within the vibration test mount by end-to-end compression. With the ball and socket seat, a compression force of about 1/10 elastic limit of the tube envelope is used. Two tubes have been vibrated in the x and y axes with full voltages applied with no ill effects on subsequent performance. These tubes were cycled at 10G between 400 and 2000 cycles for two hours on each of the x and y axes. Additional electrical tests were made, and the tubes tested appeared to meet requirements for resolution, brightness, viewing time, erasing time, writing speed, gray scale, and phosphor. (Author)

AD-258 261 Div. 8
(20 June 61) OTS price $3.60

Lansdale Div., Philco Corp., Pa.
RESEARCH AND DEVELOPMENT OF A 1000 MC GERMANIUM AMPLIFIER TRANSISTOR,
by James Biscoe. Quarterly progress rept. no. 3, 1 Jan-31 Mar 61. 31 Mar 61, 29p. incl. illus. tables (Rept. no. R 111.1)
(Contract DA 36-039-sc-85367)
Unclassified report

DESCRIPTORS: *Transistors, *Transistor amplifiers, Germanium, Ultra high frequency, Amplifiers, Design, Tests, Life expectancy, Electronic circuits, Specifications.

Investigation has led to the fabrication of devices capable of 15.2 db of power gain at 1000 mc. Typical units fabricated previously had about 12 db gain at 100 mc. A study of the relationship between rb'Cc and power gain revealed the possibility of increasing the power gain (un-neutralized) by changing the internal amplification factor of this device. The device is electrically stable, as shown by the life test results. (Author)

AD-258 264 Div. 8, 25
(20 June 61) OTS price $3.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
RESEARCH ON PARAMAGNETIC RESONANCES,
by R. L. Kyhl and M. W. P. Strandberg. Quarterly progress rept. no. 2, 15 Dec 60-15 Mar 61
15 Mar 61. 34p. incl. illus.
(Contract DA 36-039-sc-87376, Proj. 3A-99-21-021-04)
Unclassified report

DESCRIPTORS: *Paramagnetic resonance, *Microwave amplifiers, Amplifiers, Electron tubes, Nuclear spins, Lattices, Relaxation time, Electron transitions, *Microwave spectroscopy, Phonons, Microwaves, Crystal detectors, Crystal rectifiers, Cavity resonators, Design, Molecular beams, Ruby.

Research was continued to obtain and investigate amplification by inverting the population of a paramagnetic mechanical system. Some properties of spin-lattice relaxation constants are described. Limitations of electron magnetic-resonance detector sensitivity and quantitative spin determination are discussed. The observation of crossover transitions is reported. (Author)

AD-258 318 Div. 8
(26 June 61) OTS price $1.10

Electronics Research Lab., U. of Calif., Berkeley.
STUDY OF FREQUENCY-INDEPENDENT ANTENNAS,
by V. H. Rumsey, W. J. Welch and others. Quarterly progress rept. no. 3, 1 Nov 60-31 Jan 61.
28 Feb 61, 5p.
(Contract DA 36-039-sc-84923, Proj. 3-99-00-000)
Unclassified report

DESCRIPTORS: Antennas, Antenna radiation patterns, Polarization, Impedance, *Helical antennas, Phase measurement, Theory, Design, Waveguides, Tests, Measurement.

Research was continued on 3 main projects: (1) measurements of the polarization properties and azimuthal dependence of the phase of several multi-arm plane spiral antennas, (2) experimental and theoretical investigation of propagation over a plane sheet of sinusoidal wires, and (3) experimental testing of the implications of the theoretical solution for the radiation from a plane spiral antenna consisting of infinitely many spiral wires. Observations on the plane spiral antennas indicated that the practical antennas radiate only one sense of polarization. This seems reasonable on simple physical grounds. However, it is puzzling in view of the theoretical solution which admits either sense of polarization, even though a concomitant feature of the reverse-polarized solution is a backward wave of current on the structure at large distances from the center. There seems to be no simple connection between theory and practice on this point. (Author)

AD-258 325 Div. 8
(23 June 61) OTS price $3.60

Vitro Labs., West Orange, N. J.
DESIGN CRITERIA FOR RELIABLE TRANSISTORIZED ASSEMBLIES.
Quarterly engineering rept. no. 6, 1 June-31 Aug 60. 15 Sep 60, 29p. incl. illus. table.
(Rept. no. VL-2160-4-0)
(Contract NObsr-77531)
Unclassified report

Division 9 - FLUID MECHANICS

DESCRIPTORS: *Transistors, Reliability, Tests, *Electronic circuits, Measurement, Test methods, Design, *Transistor amplifiers.

Several modifications were made to the previously reported transistor parameter test circuit to enable more accurate measurements. Newly recorded data concerning transistor parameters were programmed for the Bendix G-15 computer. Five transistorized general usage assemblies underwent either minor modification or complete redesign. All changes were dictated by the requirements of assembly specifications, new transistors, or the simplification of parameter tests. The modified assemblies are the audio frequency voltage amplifier, the dual video distribution amplifier, the gated sawtooth generator, the high-level linear amplifier, and the wide band AM detector. All but the high-level linear amplifier circuit were subjected to parameter variation tests. A detailed discussion of circuit modifications, test procedures, and test results is presented. (Author)

AD-258 331 Div. 8
(26 June 61) OTS price $1.10

Stevens Inst. of Tech., Hoboken, N. J.
CAPACITOR BANK PARAMETERS,
by G. Brucker. 1 Apr 61, 10p. incl. illus. tables (Rept. no. SIT P-34(4/61))
(Contract DA 36-039-sc-78097)
(ARPA Order no. 112-60) Unclassified report

DESCRIPTORS: *Capacitors, Electronic switches, *Electronic circuits, Transmission lines, Mathematical analysis, *Electron tubes.

Experiments were carried out with the Stevens capacitor bank and the Megatron Coil Mk I as the load. The crowbarring technique was successfully applied to the bank with G. E. ignitron no. 5385. The ignitron cathode is initially connected to the high side of the bank and the anode to the low side. When the load current is at its peak, the ignitron is triggered. As the bank swings negative, the anode of the ignitron tube becomes positive with respect to the cathode and the load inductance tends to pump current through the tube from anode to cathode. Both conditions aid switch closure and are necessary for reliable crowbarring. The Datatron 220 computer was used to solve equations expressing the bank voltage for a circuit of 2 transmission lines with a total of 12 capacitors. The results of the machine calculations are given for 3 cases: (1) 4 pairs of lines, a total of 48 capacitors with the load varying from zero to 100 millimicrohenries; (2) 6 pairs of lines, a total of 72 capacitors, with the load from zero to 100 millimicrohenries; and (3) a load of zero and the bank shorted at the cables.

AD-258 338 Div. 8, 20, 25
(23 June 61) OTS price $9.10

Litton Systems, Inc., Beverly Hills, Calif.
NGL PLATFORM NUCLEAR RADIATION PROGRAM,
Bimonthly rept. no. 6, 23 Mar-23 May 61. June 61, 95p. incl. illus. tables (Rept. no. BH 59-3461.37)
(Contract AF 33(600)41452)
Unclassified report

DESCRIPTORS: *Gyroscopes, *Gyro stabilizers, *Radiation damage, *Transistors, Amplifiers, Semiconductors, *Transistor amplifiers, Gamma rays, Neutrons, Accelerometers.

Contents:
Radiation environments
  Dosimetry
  Argonne CP-5 versus Convair GTR environments
Material research and analysis
  Transistors
  Diodes
  Passive components
Component performance analysis
  Accelerometer
  Gyro
  DC amplifier
  Gyro preamplifier
  DC torquer motor
Flight data system nuclear resistance
  Nuclear resistance

AD-258 342 Div. 8
(23 June 61) OTS price $1.60

Research Inst., U. of Michigan, Ann Arbor.
THE SCATTERING APPROACH TO THE SYNTHESIS OF NONUNIFORM LINES,
by C. B. Sharpe. Mar 61, 18p. (Technical rept. no. 119; 2899-51-T)
(Contract DA 36-039-sc-78283, Proj. 3A99-06-001-01)
Unclassified report

DESCRIPTORS: *Transmission lines, Synthesis, Scattering, *Integral equations, Reflection, Impedance, Statistical functions, Fourier analysis, *Impedance matching, Perturbation theory, Mathematical analysis.

The analysis of a nonuniform transmission line is formulated as a one-dimensional scattering problem by transforming the transmission line equations into an integral equation. Approximate solutions of the integral equation for the input reflection coefficient of a nonuniform line terminated in an arbitrary impedance are obtained by employing the Neumann and Fredholm series expansions. Two examples in the application of these solutions are given. It is shown that the Fredholm solution leads to Orlov's synthesis formula by means of which the impedance variation of a nonuniform line can be calculated in terms of the input and output reflection coefficients. (Author)

9. FLUID MECHANICS

AD-257 618 Div. 9
(14 June 61) OTS price $3.60

Polytechnic Inst. of Brooklyn, N. Y.
APPROXIMATE SOLUTIONS FOR REENTRY TRAJECTORIES WITH AERODYNAMIC FORCES,
by Kenneth Wang and Lu Ting. May 61. 29p. incl. illus. (PIBAL rept. no. 647)
(Contract AF 49(638)445, Proj. 9781)
(AFOSR-684) Unclassified report

DESCRIPTORS: *Re-entry vehicles, *Re-entry aerodynamics, *Atmosphere entry, Acceleration, Lift, Drag, Terminal ballistics, Numerical analysis, Differential equations.

When the motion of the reentry vehicle is expressed in two equations for the components in the instantaneous trajectory plane, and one for the component normal to the plane, the former equations are uncoupled from the latter. Thus, the problem of a nonplanar trajectory is reduced to an equivalent planar trajectory. Approximate analytic solutions for planar trajectories with constant lift and drag coefficients are obtained by improving and extending existing analytic solutions. The present solutions are not subjected to the restrictions which are valid for drag-only vehicles at large entry angle, nor for lifting vehicle entering the atmosphere at near circular orbit velocity and shallow angles. They are derived in a closed form of simple functions expressing the relations between the velocity, the angle of inclination and the density, or elevation. Using these relations, the acceleration experienced by the pilot can be calculated and the peak value determined. The numerical results calculated for these cases, where the above restrictions are violated, show good agreement with the machine results by direct integration of the equations of motion. (Author)

AD-257 690 Div. 9, 25
(14 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE ROLE OF THE ADIABATIC EXPONENT IN CHEMICALLY VARIABLE GAS MIXTURES,
by Irene Sanger-Bred't. 9 Feb 61, 32p. incl. illus. (Trans. no. MCL-702 from Der Adiabatenexponent Bei Chemisch Veranderlichen Gasgemischen 6:35-66, 1955)
Unclassified report

DESCRIPTORS: Germany, *Specific heat, *Gases, Mixtures, Fluid mechanics, *Gas flow, Pressure, Thermodynamics, Mathematical analysis, Chemical equilibrium, Equations of state, Dissociation, *Adiabatic gas flow.

The notion of an adiabatic exponent - (the ratio of the specific heats at constant pressure and at constant volume) which had been so productive in classical gasdynamics, becomes unsuitable for thermodynamic flow, if the suppositions of constant specific heats and of constant partial pressures can no longer be maintained for the different gas components. In these cases, the heterogeneous origin of the different, only apparently uniform exponents, which occur in the flow equations, becomes evident and their numeric values begin to differ from each other. For dissociating gases, e.g., the adiabatic exponent is no longer identical with the ratio of specific heats. The influences of variable specific heats and partial pressures on the adiabatic exponent taken separately are discussed. With new, appropriately determined exponents, generalized equations for isentropic flow are established, from which the classical formula can be derived as a limit case. (Author)

AD-257 728 Div. 9
(15 June 61) OTS price $1.10

Brown U. Div. of Applied Mathematics, Providence, R. I.
STRUCTURE AND ANALYTIC TREATMENT OF GAS-DYNAMICAL WAVE PROPAGATION WITH ENTROPY VARIATION,
by R. E. Meyer. Final rept. 1 Feb 60-31 Jan 61. June 61. 5p. (Rept. no. DA-5126 (Final))
(Contract DA 19-020-ORD-5126, Proj. TB2-0001-(2311-E))
(AROD rept. no. 2311:5) Unclassified report

DESCRIPTORS: *Entropy, *Gas flow, *Shock waves, Partial differential equations.

Work performed under the contract is reviewed. The establishment of an exact, local relation between the strengths of the known and partially known waves and the rate of shock development is discussed. Its importance is that such a relation can, for the whole variety of problems covered, be put in the form of a relation between only two functions. One of them, Q, contains the influence on the shock of all that goes on in the gas ahead of the shock -- pressure wave, temperature variations, etc. -- and thus provides an immediate comparison of the relative influences of all these effects on the shock development in any particular case. The other, gamma, is a non-dimensional measure of the strength of the pressure wave catching up with the shock. The Q-gamma relation gives the exact local influence of all the processes in the gas on the rate of shock development. However, the Q-gamma relation applies primarily to initial and boundary value problems, and not to assymptotic shock propagation problems which were also derived under this contract. (Author)

AD-257 734 Div. 9
(16 June 61) OTS price $9.60

Cook Research Labs., Skokie, Ill.
DYNAMICS OF SEPARATING BODIES. VOLUME II. MEASUREMENTS AT MACH 2, 4, AND 5,
by H. L. Wackelin and R. O. Fredette. Mar 61. 69p. incl. illus. tables.
(Contract AF 29(600)1711, Proj. 7856)
(AFOSR-106) Unclassified report

DESCRIPTORS: Jettisonable equipment, Supersonic wind tunnels, *Space capsules, Flight paths, Rockets, Model tests, Supersonics, Hypersonics, *Separation.

Wind tunnel tests were conducted on a data capsule shape in the interference field of a carrier vehicle model at Mach numbers of 4.0 and 5.0 with limited data at Mach 2. The data obtained were analyzed and a preliminary evaluation made as to the agreement with methods of prediction. It is shown that in areas where the flow field is known, estimated values of the derivatives obtained with relatively simple calculation techniques agree reasonably well with the data. A discussion of the direct application of these data to capsule separation analyses is presented. (Author)

AD-257 756 Div. 9
(15 June 61) OTS price $6.60

Johns Hopkins U., Baltimore, Md.
A VORTEX IN AN INFINITE VISCOUS FLUID,
by Robert R. Long. June 61. 64p. incl. illus. table. (Technical rept. no. 11; Technical rept. no. 14 (CWB Series))
(Contract Nonr-24831, Proj. NR 082-104; In cooperation with the U. S. Weather Bureau)
Unclassified report

Division 9 - FLUID MECHANICS

DESCRIPTORS: *Vortices, Theory, Liquids, Mathematical analysis, Viscosity, Tornadoes, Atmosphere, Differential equations.

A solution is given for a viscous vortex in an infinite liquid. Similarity arguments lead to a reduction of the equations of motion to a set of ordinary differential equations. These are integrated numerically. A uniform feature is the constant circulation, K, outside the vortex core, which is also a viscous boundary layer. The circulation decreases monotonically toward the axis. The axial velocity profiles and the radial velocity profiles have several characteristic shapes, depending on the value of the non-dimensional momentum transfer, M. The solution has a singular point on the axis of the vortex. The radius of the core increases linearly with distance along the axis from the singularity, and, at a given distance, is proportional to the coefficient of viscosity and inversely proportional to K. Finally a discussion is given to indicate that intense vortices above a plate, like the confined experimental vortex, or above the ground, like the atmospheric tornado and dust whirl, will not resemble the theoretical vortex except, possibly, far above the plate. (Author)

AD-257 757 Div. 9, 10, 25, 27
(15 June 61) OTS price $3.60

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
TASK R.
Quarterly progress rept. no. 8, 1 Jan-31 Mar 61. 31 Mar 61, 1v. incl. illus. tables (Rept. no. TG-331-8)
(Contract NOrd-7386)
(ARPA Order no. 22-59, Task 5)
Unclassified report

DESCRIPTORS: High temperature research, Reaction kinetics, Fluid mechanics, *Flames, Methanes, Oxygen, Hydrogen, Atoms, Chemical analysis, Sampling, Free radicals, Mass spectroscopy, *Gas flow, *Heat transfer, Transport properties, Gas diffusion, Nitrogen, Carbon dioxide, Quantitative analysis, *Rocket motor nozzles, Solid rocket propellants, Pressure, Design, Infrared spectroscopy, Thermodynamics, Gases, *Combustion chamber gases.

HIGH TEMPERATURE CHEMICAL KINETICS IN LAMINAR FLAMES: High temperature chemical kinetic information was obtained by means of the detailed analysis of laminar flame structure. Work has continued on developing a scavenger probe technique for H-atoms. A preliminary profile of H-atom concentration in a spherical CH4-O2 flame was obtained, as were several results on H-atoms generated in an electrodeless discharge. THERMAL CONDUCTIVITY OF GASES: High temperature gas thermal conductivity measurements by means of a line source in a laminar flow are being carried out. Data on CO2-N2 mixtures are being obtained. ROCKET NOZZLE FLUID DYNAMICS: Experimental measurement was made of the flow properties in a rocket nozzle employing a typical solid propellant. Previously noted differences between the experimental and theoretical pressure distribution in the standard 25 degree nozzle was studied and discussed. IR spectroscopic results were obtained in the nozzle, both in situ and in gases sampled from the flow. (Author)

AD-257 799 Div. 9
(15 June 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
INVESTIGATION OF AN AXISYMMETRIC INTERNAL COMPRESSION INLET AT A MACH NUMBER OF ABOUT 3.8, by John H. Lundell, Richard Scherrer, and Lewis A. Anderson. June 61. 31p. incl. illus. table. (NASA Technical note D-854)
Unclassified report

DESCRIPTORS: *Aerodynamics, *Supersonics, *Axially symmetric flow, *Jet engine inlets, Transonics, *Boundary layer, Model tests, Boundary layer control, Pressure, *Supersonic diffusers, Diffusers.

An idealized axisymmetric, all-internal compression inlet was designed for a Mach number of 3.75. The objective of the design was to obtain a steady, one-dimensional transonic flow and a high over-all total-pressure recovery. Boundary-layer removal was employed in the vicinity of the inflection point of the supersonic contour. Static- and total-pressure fluctuations were measured in the transonic flow region. A total-pressure recovery of about 90 percent was obtained with a boundary-layer-removal mass-flow rate of 15 percent of the inlet mass-flow rate. The accompanying root-mean-square total-pressure fluctuation in the throat region was only 1 percent of the free-stream total pressure. The test Mach number was 3.80 and the Reynolds number based on inlet diameter was 2.63 times 10 to the 6th power. (Author)

AD-257 800 Div. 9, 1
(16 June 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
A FLIGHT EXAMINATION OF OPERATING PROBLEMS OF V/STOL AIRCRAFT IN STOL-TYPE LANDING AND APPROACH, by Robert C. Innis and Hervey C. Quigley. June 61, 43p. incl. illus. table, 10 refs. (NASA Technical note D-862)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-862.

DESCRIPTORS: *Vertical take-off planes, *Short take-off planes, Flight testing, Airplane landings, *Transport planes, Stability, Control, *Aerodynamics, Lift, Drag, Stalling, *Control systems, Stability (Longitudinal), Stability (Lateral).

The operating envelope of a large twin-engined STOL aircraft has been examined and general limitations have been pointed out which the pilot must consider when choosing a minimum landing approach speed for STOL aircraft. The significance of satisfactory stability and control characteristics in this regard is discussed. The problems reviewed in the report would also be representative of those of a large, over-loaded VTOL aircraft operating in an STOL manner. (Author)

AD-257 807 Div. 9, 12
(16 June 61) OTS price $5.60

Polytechnic Inst. of Brooklyn, N. Y.
THE DOWNSTREAM INFLUENCE OF MASS TRANSFER AT THE

NOSE OF A SLENDER CONE,
by Robert J. Cresci and Paul A. Libby. Rept. for Feb 60-Feb 61 on Experimental Techniques for Materials Research and Research on Aerodynamic Flow Fields. May 61, 46p. incl. illus. (PIBAL rept. no. 634)
(Contracts AF 33(616)5944, Proj. 7364 and AF 33(616)7661, Proj. 7064)
(WADD TR 60-892) Unclassified report

DESCRIPTORS: *Hypersonic flow, Shock waves, Ablation, Diffusion, *Conical bodies, *Heat transfer, Coolants, *Film cooling, *Sweat cooling, Boundary layer, Pressure, Helium, Turbulent boundary layer, Laminar boundary layer, Gas flow, Nitrogen, *Guided missile noses, Hypersonic wind tunnels, Tests.

The influence of localized mass transfer at the nose of a slender cone under hypersonic flow conditions was studied by experimental and theoretical means. Two gaseous coolants, nitrogen and helium are injected through a porous plug subtending a half angle of 30 degrees. The effect of the mass transfer on the shock shape, pressure distribution, heat transfer and transition are investigated. The theoretical analysis involved a study of the effect of mass transfer on the shock stand-off distance and leads to an inviscid flow parameter permitting the experimentally determined shock shape and pressure distribution to be extrapolated to other than test conditions and to other coolant gases. Significant reductions in heat transfer are obtained with injection. Indeed with small amounts of helium injection the peak heating is found to occur downstream on the cone and to be an order of magnitude less than would occur at the stagnation point without mass transfer. With nitrogen early transition is found to occur so that local heating rates are actually increased over those prevailing at the same Reynolds number without injection. (Author)

AD-257 808 Div. 9
(16 June 61) OTS price $1.60

Polytechnic Inst. of Brooklyn, N. Y.
AN APPROXIMATE SOLUTION FOR THE AXISYMMETRIC JET OF A LAMINAR COMPRESSIBLE FLUID,
by Gdalia Kleinstein. Rept. on Research and Aerodynamic Flow Fields. Apr 61, 10p. incl. illus. (PIBAL rept. no. 648)
(Contract AF 33(616)7661, Proj. 7064)
(ARL-51) Unclassified report

DESCRIPTORS: *Compressible flow, *Gas flow, Numerical methods and procedures, Numerical analysis, *Axially symmetric flow, Velocity, Partial differential equations, Transformations (Mathematics), *Laminar boundary layer, Operators (Mathematics), Viscosity, Jets.

An extension of the modified-Oseen method of Carrier, based on the linearization of the viscous term of the von Mises transformation, is presented. The method is employed to determine the velocity field associated with the laminar axisymmetric jet flow of a compressible gas with an arbitrary but constant external flow. The approximate solution is shown to be in good agreement with the exact numerical calculation of Pai (Quart, App. Math. 10:No. 2, 141-148 (1952)). (Author)

AD-257 824 Div. 9, 25
(20 June 61) OTS price $19.75

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
HYDRAULICS OF GAS-LIQUID SYSTEMS (Gidravlika Gaso-Zhidkostiykh Sistem)
by S. S. Kutateladze and M. A. Styrikovich. Sep 60, 305p. incl. illus. tables, 81 refs. (Trans. no. F-TS-9814 from Gosudarstvennoye Energeticheskoye Izdatel'stvo, Moscow: 232p., 1958)
Unclassified report

DESCRIPTORS: USSR, *Gas flow, *Fluid mechanics, *Liquids, Mixtures, *Hydrodynamics, Equations, Mathematical analysis, Thin films, Theory, Bubbles, Boiling, Heat transfer, Spray nozzles, Drops, Film boiling, *Gases, *Fluid flow, Atomization.

An attempt is made at a systematic description of the most essential laws governing the combined motion of a gas and a liquid. As a basic subject of research, the problems considered are: the motion of a gas-liquid mixture in pipes, bubbling, atomization of a liquid by mechanical and pneumatic spray nozzles, critical regimes of boiling, and several other problems. The book is designed for scientific workers, engineers, and students specializing in the fields of physical-heat engineering, power engineering, hydromechanics, chemical processes, and equipment. (Author)

AD-257 834 Div. 9, 25
(16 June 61) OTS price $5.60

Washington U., Seattle.
SLIP FLOW IN THE LAMINAR BOUNDARY LAYER OVER A FLAT PLATE AT HYPERSONIC SPEEDS,
by Robert E. Street. Final technical rept. 1 July 59-31 Dec 60. Apr 61, 44p. incl. illus.
(Contract AF 49(638)440)
(AFOSR-558) Unclassified report

DESCRIPTORS: *Laminar boundary layer, *Hypersonic flow, *Sheets, Transformations (Mathematics), Mathematical analysis, Partial differential equations, Heat transfer, Differential equations.

First order slip in the boundary layer on a flat plate is obtained by adding on to the no slip solution the normal derivative of the no slip solution multiplied by a suitably small parameter. Although carried out only for the similar solution obtained when the pressure gradient is inversely proportional to the square root of distance along the plate, the method can be extended to non-similar solutions. The cases of hypersonic flow in differing ambient temperature environment were calculated and they indicated the effects of slip to cover a considerable extent of flow for an inch or two downstream of the leading edge. The results were essentially the same as those obtained by Casaccio (J. Aero. Space Sci. 27:319-320, (1960); Republic Aviation Corp. RAC No. 643-100(1959)). It was found that there is a dependence of the coefficients in the slip boundary conditions upon the form of the similarity transformation of the boundary layer equations. (Author)

AD-257 851 Div. 9
(19 June 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
THEORETICAL EVALUATION OF THE PRESSURES, FORCES,

AND MOMENTS AT HYPERSONIC SPEEDS ACTING ON ARBITRARY BODIES OF REVOLUTION UNDERGOING SEPARATE AND COMBINED ANGLE-OF-ATTACK AND PITCHING MOTIONS, by Kenneth Margolis. June 61, 32p. illus. (Technical note no. D-652)

Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-652.

DESCRIPTORS: *Bodies of revolution, Theory, Stability, Hypersonics, Pressure, Moments, Aerodynamic configurations, Aerodynamics, Yaw, Surfaces.

Equations based on Newtonian impact theory have been derived and a computational procedure developed which enables the determination of the aerodynamic forces and moments acting on arbitrary bodies of revolution with nondecreasing cross-sectional area distributions undergoing either separate or combined angle-of-attack and pitching motions. The analysis considers variations in angle of attack from minus 90 degrees to 90 degrees and allows for both positive and negative pitching velocities of arbitrary magnitude. The results are also directly applicable to bodies in either separate or combined sideslip and yawing maneuvers. (Author)

AD-257 852 Div. 9
(19 June 61) OTS price $3.00

National Aeronautics and Space Administration, Washington, D. C.
CHARTS FOR CONICAL AND TWO-DIMENSIONAL OBLIQUE-SHOCK FLOW PARAMETERS IN HELIUM AT MACH NUMBERS FROM ABOUT 1 TO 100,
by Arthur Henderson, Jr. and Dorothy O. Braswell. June 61, 183p. incl. illus. tables. (Technical note no. D-819)

Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-819.

DESCRIPTORS: Helium, *Shock waves, Mach number, Conical bodies, *Nomographs, *Aerodynamics, Supersonics, *Hypersonics, Digital computers, Hypersonic flow, Wedges, Subsonic flow, Gas flow, Hypersonic flow, Supersonic flow.

Charts are presented for the determination of certain flow properties in the flow field and on the surface of cones and wedges at Mach numbers from about 1 to 100 in a perfect gas with a ratio of specific heats of 5/3. In addition, a table of the isentropic subsonic flow parameters is included. (Author)

AD-257 853 Div. 9, 12, 14
(19 June 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
SUPERSONIC PANEL FLUTTER TEST RESULTS FOR FLAT FIBER-GLASS SANDWICH PANELS WITH FOAMED CORES,
by W. J. Tuovila and John G. Presnell, Jr. June 61, 15p. incl. illus. tables (Technical note no. D-827)

Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-827.

DESCRIPTORS: *Flutter, Tests, *Supersonics, *Aerodynamics, *Sandwich panels, Airframes, Stresses, Pressure, Honeycomb cores, Glass textiles, Laminates, Sandwich construction, *Insulating materials, Thermal insulation, *Jettisonable equipment, Expanded plastics, Plastics, Satellite vehicles, Hypervelocity vehicles, Re-entry vehicles, Spaceships.

Flutter tests were made on flat panels having a 1/4-inch-thick plastic-foam core covered with thin fiber-glass laminates. The testing was done in the Langley Unitary Plan wind tunnel at Mach numbers from 1.76 to 2.87. The flutter boundary for these panels was found to be near the flutter boundary of thin metal panels when compared on the basis of an equivalent panel stiffness. The results also demonstrated that the depth of the cavity behind the panel has a pronounced influence on flutter. Changing the cavity depth from 1 1/2 inches to 1/2 inch reduced the dynamic pressure at start of flutter by 40 percent. No flutter was obtained when the spacers on the back of the panel were against the bottom of the cavity. (Author)

AD-257 854 Div. 9
(19 June 61) OTS price $2.00

National Aeronautics and Space Administration, Washington, D. C.
PRESSURE DISTRIBUTIONS AND WAVE DRAG DUE TO TWO-DIMENSIONAL FABRICATION-TYPE SURFACE ROUGHNESS ON AN OGIVE CYLINDER AT MACH NUMBERS OF 1.61 AND 2.01,
by K. R. Czarnecki and William J. Monta. June 61. 78p. incl. illus. tables (Technical note no. D-835)

Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-835.

DESCRIPTORS: *Ogives, *Supersonics, *Drag, *Cylindrical bodies, *Pressure, Shock, Boundary layer, Reynolds number, Airplane protuberances, Turbulent boundary layer, Test methods, Tests, Aerodynamics, Air speed, Supersonic flow, Aircraft, Guided missiles, Satellite vehicles, Friction, Fluid mechanics, Surface properties, Pitot tubes, Schlieren photography, Aircraft finishes.

Ten types of surface roughness, including step, wave, crease, and swept configurations were investigated. The tests were made on an ogive cylinder of fineness ratio 12.2, the roughness elements covering the cylindrical portion of the model. Wave drag was the major component of the drag due to roughness at supersonic speeds. The pressure distributions over the roughness elements were generally in good agreement with linearized two-dimensional theory except for regions of the elements affected by boundary-layer separation and shock detachment. There was little or no effect of Reynolds number except on the pressures within the regions influenced by separation of shock detachment. The wave drag decreased as the free-stream Reynolds number was decreased. (Author)

AD-257 856 Div. 9, 12
(20 June 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
LAMINAR HEAT-TRANSFER AND PRESSURE-DISTRIBUTION

STUDIES ON A SERIES OF REENTRY NOSE SHAPES AT A MACH NUMBER OF 19.4 IN HELIUM,
by Richard D. Wagner, Jr., W. Clint Pine and Arthur Henderson, Jr. June 61, 39p. incl. illus. tables (Technical note no. D-891)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-891.

DESCRIPTORS: *Heat transfer, *Hypersonic flow, *Re-entry vehicles, Guided missile noses, Laminar boundary layer, *Pressure, Hypersonic wind tunnels, Tests.

An experimental investigation was conducted in the 2-in. helium tunnel at the Langley Research Center at a Mach number of 19.4 to determine the pressure distributions and heat-transfer characteristics of a family of reentry nose shapes. The pressure and heat-transfer-rate distributions on the nose shapes are compared with theoretical predictions to ascertain the limitations and validity of the theories at hypersonic speeds. The experimental results were found to be adequately predicted by existing theories. Two of the nose shapes were tested with variable-length flow-separation spikes. The results obtained by previous investigators of spike-nose bodies were found to prevail at the higher Mach number of the present investigation. (Author)

AD-257 857 Div. 9, 1
(20 June 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
STATIC STABILITY AND CONTROL OF CANARD CONFIGURATIONS AT MACH NUMBERS FROM 0.70 TO 2.22 - TRIANGULAR WING AND CANARD WITH TWIN VERTICAL TAILS,
by Victor L. Peterson. June 61, 38p. incl. illus. 11 refs. (Technical note no. D-1033)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1033.

DESCRIPTORS: *Canard configuration, Control, Stability, *Transonics, *Aerodynamics, Airplanes, *Supersonics, Triangular wings, Stability (Lateral), Stability (Longitudinal), *Aerodynamic configurations, Lift, Moments, *Wing-body configurations.

The static aerodynamic characteristics of a canard airplane configuration having twin vertical stabilizing surfaces are presented. The model consisted of a wing and canard both of triangular plan form and aspect ratio 2 mounted on a Sears-Haack body of fineness ratio 12.5 and two swept and tapered wing-mounted vertical tails of aspect ratio 1.35. Data are presented for Mach numbers from 0.70 to 2.22 and for angles of attack from -6 degrees to +18 degrees at 0 degrees and 5 degrees sideslip. Tests were made with the canard off and with the canard on. Nominal canard deflection angles ranged from 0 degrees to 10 degrees. The Reynolds number was 3.68 times 10 to the 6th power based on the wing mean aerodynamic chord. Selected portions of the data obtained in this investigation are compared with previously published results for the same model having a single vertical tail instead of twin vertical tails. (Author)

AD-257 858 Div. 9, 1
(20 June 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
LARGE-SCALE WIND-TUNNEL TESTS OF AN AIRPLANE MODEL WITH AN UNSWEPT, TILT WING OF ASPECT RATIO 5.5, AND WITH FOUR PROPELLERS AND BLOWING FLAPS,
by James A. Weiberg and Curt A. Holzhauser. June 61, 33p. incl. illus. table (Technical note no. D-1034)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-1034.

DESCRIPTORS: *Airplanes, Wind tunnel models, *Vertical take-off planes, Transport planes, *Convertible airplanes, *Boundary layer control, Model tests, *Flaps, *Aerodynamics, Tests, Thrust, Ground effect, Lift, Drag, Aerial propellers, Wings, Leading-edge flaps, Boundary layer control systems, *Airplane models, *Control surfaces, Moments, Effectiveness.

Tests were made of a large-scale tilt-wing deflected-slipstream VTOL airplane with blowing-type BLC trailing-edge flaps. The model was tested with flap deflections of 0 degrees without BLC, 50 degrees with and without BLC, and 80 degrees with BLC for wing-tilt angles of 0, 30, and 50 degrees. Included are results of tests of the model equipped with a leading-edge flap and the results of tests of the model in the presence of a ground plane. (Author)

AD-257 862 Div. 9, 12
(21 June 61) OTS price $2.60

AeroChem Research Labs., Inc., Princeton, N. J.
STEADY STATE SURFACE TEMPERATURES OF RADIATION COOLED BODIES IN DISSOCIATING ATMOSPHERES,
by Daniel E. Rosner. Feb 61, 14p. incl. illus. (Technical Pub. no. 26)
(Contract AF 49(638)300)
(AFOSR-697) Unclassified report

DESCRIPTORS: *Surface temperatures, Superaerodynamics, Thermal radiation, Cooling, *Reentry vehicles, Planetary atmospheres, Heat transfer, Mathematical analysis, Boundary layer.

The conditions under which the skin temperature of a radiation cooled vehicle in a dissociating atmosphere can exceed that in an inert atmosphere at the same vehicle velocity are investigated. If the Lewis-Semenov number for atom diffusion is greater than unity, this is found to be possible for both radiation-cooled active catalytic surfaces in the chemically frozen regime and solids of arbitrary catalytic activity in the chemical equilibrium region. (Author)

AD-257 890 Div. 9, 27
(21 June 61) OTS price $2.60

Convair, San Diego, Calif.
ON THE MIXING PROBLEM OF AN AXI-SYMMETRIC FREE JET INTO AIR INCLUDING CHEMICAL REACTIONS,
by Inge L. Ryhming. Mar 61, 22p. incl. table (Rept. no. ZA-332)
(Contract AF 19(604)5554, Proj. Defender)
(ARPA Order no. 116-60) Unclassified report

DESCRIPTORS: Turbulent flow, *Jets, *Jet mixing flow, *Fluid flow, *Gas flow, Supersonic flow, Supersonics, Rocket propul-

sion, Air, Mixtures, Velocity, Temperature, Mathematical analysis, Axially symmetric flow, Thermodynamics, Chemical reactions, Diffusion, *Gas diffusion, *Exhaust gases, Gases, Combustion chamber gases, Carbon compounds, Oxygen, Hydrogen, Monoxides, Carbon dioxide, Water.

Velocity and temperature fields together with specie concentrations are computed for an axially symmetric, supersonic, hot, free jet mixing with quiescent air. Based on simplifying assumptions regarding the chemistry involved, the problem can be divided in two parts. One of these parts is to determine the velocity and temperature field. The second part consists of integrating the continuity of the specie equations when the solution to the first part of the problem is obtained. Two different cases are considered frozen and equilibrium flow. (Author)

AD-258 009 Div. 9
(22 June 61) OTS price $8.10

Rosemount Aeronautical Labs., U. of Minn., Minneapolis.
EXPERIMENTAL INVESTIGATIONS OF LAMINAR HEAT TRANSFER AND TRANSITION WITH FOREIGN GAS INJECTION - A 16-DEGREE POROUS CONE AT MACH 5,
by C. J. Scott. Oct 60, 1v. incl. illus. table, 37 refs. (Research rept. no. 174)
(Contract AF 49(638)558)
(AFOSR TN 60-1370) Unclassified report

DESCRIPTORS: Airplane noses, Guided missile noses, Rocket noses, *Conical bodies, *Heat transfer, Laminar boundary layer, Cooling, Coolants, Helium, Nitrogen, Gases, Fluid flow, Porous materials, *Sweat cooling, *Hypersonic flow.

Experiments on two porous 16-degree cones at Mach number 5 are discussed which present the effects of helium and nitrogen injection on the stability of the laminar boundary layer. Large surface cooling and extreme injection rates are included. Heat transfer measurements with these two coolants are also presented. Since the experiments neither confirm nor invalidate the details of the theory, special emphasis is placed on the discussions of experimental procedures and data reduction methods. Analytical estimates of the effect of the solid tip followed by a uniform-injection cone are presented. An analysis of the effect of surface mass addition on viscous boundary layer-external flow interactions is included. A correlation of data on fluid flow through porous media in the slip-flow regime is presented. (Author)

AD-258 079 Div. 9
(22 June 61) OTS price $4.60

Technische Hochschule, Munich (Germany).
METHODS OF HYPERSONIC FLOW THEORY,
by Christoph V. Conta. 28 Feb 61, 39p. incl. illus. (Technical note no. 3)
(Contract AF 61(052)377)
(AFOSR-809) Unclassified report

DESCRIPTORS: *Hypersonic flow, Theory, Aerodynamic configurations, Shock waves, *Blunt bodies, Operators (Mathematics).

Shock relations of an ideal gas are discussed for two limiting cases (OSWATITSCH, K:Z. Angew. Math. U. Phys. 2:249-264, 1951 and TSIEN, H.S.:J. Math. and Phys. 25:247-251, 1946). The first triangle of the characteristic net is investigated for the case of plane flow past a contour with attached bow shock. Results are applied to shock expansion method and power law bodies. In the case of blunt bodies, relations on the boundary of the elliptic region are considered. NEWTONian theory is discussed. (Author)

AD-258 161 Div. 9, 25
(19 June 61) OTS price $4.60

Oklahoma State U. Research Foundation, Stillwater.
DILATATIONAL WAVE TRANSMISSION THROUGH A VISCOELASTIC LAYER AT NORMAL INCIDENCE,
by George B. Thurston and Shi-Yu Wu. June 61, 29p. incl. illus. tables.
(Contract Nonr-259503, Proj. NR 385-545)
Unclassified report

DESCRIPTORS: *Wave transmission, Reflection, Pressure, *Sound, *Water waves, Elasticity, Viscosity, Water, Air, Steel, Rubber, Linear systems, Mathematical analysis.

The theory of transmission of a plane dilatational wave through an infinite plane layer is considered where the three media involved are assumed to be linearilly viscoelastic, their properties being specified by four elastic constants. Relations for the complex transmission and reflection factors are obtained as well as for the intensity relations and specific acoustic impedance in the incident medium. The equations of state for a viscoelastic fluid and viscoelastic solid are used to relate the basic elastic constants to the basic propagation constants for the media. The transmission relations are then given in terms of these propagation constants. Computed transmission characteristics for water through steel into air and for water through rubber into air are presented and the dependence of these characteristics on the dissipative properties of the media are shown. These numerical examples illustrate the transition of transmission properties in going from low frequency, thin plate conditions to high frequency, thick plate conditions. Special relations for these limiting conditions are also given. (Author)

AD-258 193 Div. 9, 25, 30
(26 June 61) OTS price $8.10

Stanford Research Inst., Menlo Park, Calif.
CALIBRATION OF PRESSURE GAGES IN DUST-LADEN AIR FLOW,
by Horst W. Kriebel and A. R. Kriebel. Final rept. on Phase 1. June 61, 80p. incl. illus.
(Contract DA 49-146-XZ-024)
(DASA-1204) Unclassified report

DESCRIPTORS: Particles, *Gas flow, Pressure, *Gages, *Load distribution, Measurement, Errors, Calibration, Dynamics, Theory, Test facilities.

During nuclear weapons tests a series of gages was used to measure the airblast dynamic pressure. Presence of desert dust raised questions about the evaluation of results. Six of these gages were tested. A rough theoretical analysis predicts the performance of most of the gages tested with reasonable accuracy and shows the

effect of dust loading and airblast velocity on their calibration. Results indicate that a combination of the measurements from two of the gages tested (Sandia Snob gage and the SRI-Z gage) is likely to lead to the most reliable data. Where results from only a single gage are available, some independent way, such as photographic records, must be used to estimate dust loading before the dust effect can be evaluated. (Author)

AD-258 194 Div. 9, 13, 25
(26 June 61) OTS price $8.60

Stanford Research Inst., Menlo Park, Calif.
A FIRST ORDER SOLUTION FOR THE IMPINGEMENT DRAG OF CYLINDERS AND SPHERES IN A STEADY PARTICLE-LADEN GAS FLOW,
by Fred N. Sauer. Final technical rept. pt. 1 on Phase 2. June 61, 80p. incl. illus. 24 refs.
(Contract DA 49-146-XZ-024)
(DASA-1206) Unclassified report

DESCRIPTORS: Particles, *Gas flow, *Shock waves, *Load distribution, Pressure, Structure, Construction, Spheres, Cylindrical bodies.

Drag due to impingement of particles on spheres and cylinders in a steady, particle-laden gas flow has been derived using NASA results for particle collection efficiencies for these targets. This analysis shows impingement drag to be a function of particle inertia parameter, the particle reflection coefficient on impact with the target, particle and target Reynolds numbers, listed in order of importance. For target Reynolds numbers greater than 1000, scaling of experimental impingement drag data should be based primarily on the particle inertia parameter. Consequently, small targets, e.g., models, will be expected to experience greater particle drag effects than do large targets under the same flow conditions. Comparison of theoretical results with the relatively few available total drag data show discrepancies in numerical values of 2:1 or larger, some of which may be due to questionable experimental results. (Author)

AD-258 223 Div. 9, 12
(26 June 61) OTS price $3.60

Naval Ordnance Test Station, China Lake, Calif.
NOTES ON ANALYTICAL TECHNIQUES IN AERODYNAMIC HEATING PROBLEMS,
by C. H. Johnson, William H. Smith, and J. R. Katz. 28 Apr 61, 34p. incl. illus. (NOTS TP 2677)
(NAVWEPS rept. no. 7653)
Unclassified report

DESCRIPTORS: *Aerodynamic heating, *Guided missiles, Simulation, *Heat transfer, Surface temperatures, *Analog computers, Tests, Test methods, Temperature, Rocket motors, Mathematical analysis, Heating, Model tests, Rocket propellants, Propellant grains, Partial differential equations, Thickness, Guided missile noses, Themal insulation, Functions.

TEMPERATURE CHANGES DURING HEATING OF AN HPAG 5.0-INCH MOTOR: CORRELATION OF EXPERIMENTAL DATA WITH ANALOG COMPUTATIONS, by C. H. Johnson: Temperature data on a 5.0-inch HPAG rocket motor served to guide the set up of an analog computer model. The study was prompted by observations that temperatures in heated Sidewinder 1C motors differed appreciably depending on whether the test point was at the top, side, or bottom of the motor. DETERMINATION OF WALL TEMPERATURE-TIME FUNCTIONS USING AN ANALOG COMPUTER, by William H. Smith: The use of an analog computer to obtain solutions of the outside surface temperature of aerodynamically heated bodies resulted in a large saving over hand solutions. WHEN IS A SKIN THERMALLY THIN, by Jerome R. Katz: A method for determining skin thickness is discussed for 1, 5, and 10% variations in temperature throughout the material.

AD-258 226 Div. 9, 25
(21 June 61) OTS price $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
DIFFUSION FROM A SLIGHTLY IONIZED REGION IN A UNIFORM FLOW,
by A. C. Pipkin. Apr 61, 19p. (Technical note no. BN-240)
(Contract AF 49(638)401)
(AFOSR-707) Unclassified report

DESCRIPTORS: Gas flow, *Gas ionization, *Ions, *Electrons, *Diffusion, Electric fields, *Shock waves, Fluid mechanics.

A neutral gas is considered in steady one-dimensional motion, passing through a zone in which ionization takes place at a small given rate. The diffusion of the ions from the place where they are formed is investigated, with particular attention for the upstream diffusion. The neutral atom stream is regarded as a uniform background in which the ion diffusion takes place. Of great importance is the determination of the electric field which results from the diffusion of the ions and strongly influences their motion. The application of the results to the case where a shock is present is discussed. (Author)

AD-258 232 Div. 9
(22 June 61) OTS price $2.60

Pisa U. (Italy).
LINEARIZED SUPERSONIC FLOW IN AN AXISYMMETRIC JET ISSUING IN AIR AT REST,
by Enrico Pistolesi and Marino Marini. Mar 61, 1v. incl. illus. (Technical rept. no. 1)
(Contract AF 61(052)209)
(AFOSR-852) Unclassified report

DESCRIPTORS: *Supersonic flow, Aerodynamics, *Wings, *Jets, Integral transforms, Velocity, Pressure, Equations, *Axially symmetric flow, Gas flow, Supersonic nozzles, Mathematical analysis, Numerical methods and procedures.

Study concerns the aerodynamic characteristics of a wing disposed in a supersonic stream at some finite distance from the discharge of an axisymmetric supersonic jet. Such research requires that the flow field around an axisymmetric supersonic jet issuing from a nozzle in a supersonic stream be known. A new method was used to study the flow in the jet, based on the use of particular singularities, called pseudo-sources, disposed on the jet axis. The main aspects of this method are developed and the method itself is applied to the simple case of a supersonic axisymmetric jet issuing in air at rest. The jet shape was determined and some of the main characteristics of the flow in the jet are examined. Satisfactory results were obtained. (Author)

Division 9 - FLUID MECHANICS

AD-258 243 Div. 9, 22
(20 June 61) OTS price $5.60

Naval Ordnance Lab., White Oak, Md.
INVESTIGATION OF THE FLOW OVER AN AXISYMMETRIC COMPRESSION SURFACE AT HIGH MACH NUMBERS,
by J. L. Lankford. May 61, 19p. illus. tables, 14 refs.
(NAVORD rept. no. 6866) Unclassified report

DESCRIPTORS: *Supersonics, Aerodynamics, Boundary layer, *Hypersonics, *Projectiles, Separation, Temperature, Aerodynamic configurations, Bodies of revolution, Tests.

Axisymmetric compression surfaces designed for Mach number 7 were fired as projectiles in the NOL pressurized ballistics range no. 3. Range pressures varied from approximately 100 to 300 mm of mercury with a few firings at 1 atmosphere. Range temperature was the ambient or room temperature. Mach numbers from 4.5 to 7.4 were recorded. Results are presented in the form of spark photographs from which data on flow fields and boundary-layer conditions were obtained. The data are analyzed and compared with theory. Although the wall temperatures are too low for simulation of a flight case and the boundary layer appears laminar, the results are of general interest because they represent conditions with a thin boundary layer on a cold surface. A strong effect of wall temperature on separation is noted. (Author)

AD-258 244 Div. 9
(20 June 61) OTS price $2.60

Naval Ordnance Lab., White Oak, Md.
THE EFFECT OF HEAT TRANSFER ON THE SEPARATION OF LAMINAR FLOW OVER AXISYMMETRIC COMPRESSION SURFACES, PRELIMINARY RESULTS AT MACH NUMBER 6.78,
by J. L. Lankford. May 61, 1v. incl. illus. tables (Aerodynamics research rept. no. 138)
(NAVWEPS rept. no. 7402) Unclassified report

DESCRIPTORS: *Heat transfer, *Separation, Pressure, Tests, Test methods, Hypersonics, *Hypersonic flow, Surface temperatures, Thermocouples, Wind tunnel models, *Conical bodies, Conductivity, Temperature, Cylindrical bodies, Test equipment, Laminar boundary layer, Surfaces, Aerodynamics.

The strong effect of heat transfer on the laminar separation phenomena on hypersonic compression surfaces was clearly demonstrated. A transient model technique using a model with a moderately thick wall was used to obtain a relatively constant isothermal wall condition. When the model is made of a material of fairly high conductivity, simple heat transfer calculations can be used to roughly predict its performance. The erosion of the model surface is almost eliminated by this method. The trend of laminar separation was confirmed by more precise experiments. Laminar separation on axisymmetric compression surfaces was strongly affected by wall temperature or by the value of the ratio of wall to stagnation temperature. (Author)

AD-258 251 Div. 9, 25
(21 June 61) OTS price $1.60

Magnetogasdynamics Lab., Mass. Inst. of Tech., Cambridge.
HEAT TRANSFER TO COLD ELECTRODES IN A FLOWING IONIZED GAS,
by James A. Fay and William T. Hogan. Apr 61, 14p. illus. (Rept. no. 61-2)
(Contract AF 49(638)643, Proj. 9781)
(AFOSR-595) Unclassified report

DESCRIPTORS: *Gas flow, Gas ionization, Shock waves, Shock tubes, *Heat transfer, *Electrodes, Magnetohydrodynamics, Instrumentation, Experimental data, Electrical properties, *Resistance.

Shock tube experiments were devised to provide an aerodynamically clean flow of a partially ionized gas over a cold electrode (approximately room temperature). The electrodes were tungsten wires placed in a shock tube with their axes normal to the shock tube axis, and hence perpendicular to the oncoming flow. For the special circumstances of the experiments considered, the heating of the electrodes in excess of that due to aerodynamic effects was proportional to the current over the observable range of 100 to 1000 amp/sq cm. The excess heating rate divided by the total current was found to be 4.9 volts for the anode and 3.2 volts for the cathode. The gas resistance as cumputed under the assumptions of uniform conductivity of the fluid between the electrodes plus a fixed voltage drop at the electrodes compared fairly well with experimental values for large electrode separations, but were below experimental values for close electrode spacing. In a carefully designed experiment, it is likely, therefore, that electrical conductivity of gases can be measured by this method. (Author)

AD-258 266 Div. 9, 27
(26 June 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
EFFECTS OF BOATTAILING AND NOZZLE EXTENSION ON THE THRUST-MINUS-DRAG OF A MULTIPLE-JET CONFIGURATION,
by William R. Scott. June 61, 48p. incl. illus.
(NASA technical note D-887)
Unclassified report

Also available from NASA, Washington 25, D. C. as NASA Technical note D-887.

DESCRIPTORS: Thrust, Drag, Aerodynamic configurations, Aerodynamics, Supersonics, Transonics, Supersonic nozzles, Nozzles, *Booster rockets, *Guided missile boosters, *Rocket motor nozzles, Pressure, Exhaust gases, Rocket motors.

The investigation was conducted at Mach numbers from 0.60 to 1.40 and jet total-pressure ratios from 3 to 20. Three different boattails were tested: an 8-degree conical afterbody, a 16-degree circular-arc afterbody, and a third afterbody having a linear area variation with length. A cylindrical afterbody also was tested for comparison purposes. Extending from these bodies were four circular jet nozzles with a design Mach number of 2.5 which were spaced symmetrically about the body center line. The 8-degree conical afterbody provided the highest net thrust efficiency factors when the nozzle exits were at the optimum longitudinal location. The other afterbodies in order of decreasing performance were the 16-degree circular-arc, the straight-line-area-distribution, and the cylindrical. (Author)

AD-258 267 Div. 9, 1
(26 June 61) OTS price $2.75

National Aeronautics and Space Administration
Washington, D. C.
AERODYNAMIC CHARACTERISTICS OF A FOUR-PROPELLER TILT-WING VTOL MODEL WITH TWIN VERTICAL TAILS.

INCLUDING EFFECTS OF GROUND PROXIMITY,
by K. J. Grunwald. June 61, 137p. (NASA Technical note D-901)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-901.

DESCRIPTORS: *Aerodynamics, *Vertical take-off planes, Model tests, Wind tunnel models, Ground effect, *Stability, Tests, Flaps, Stability (Lateral), Test methods, Tails, Stabilizers (Horizontal tail surface), Wings, Stalling, Air brake flaps, *Convertible airplanes, Aerial propellers, *Control, Aerodynamic configurations, Lift, Stability (Longitudinal).

A wind-tunnel investigation was made of the aerodynamic stability, control, and performance characteristics of a model of a four-propeller tilt-wing VTOL airplane employing flaps and speed brakes through the transition speed range. The wing was stalled for steady level flight for all conditions of the investigation; however, the flapped configuration did produce a higher maximum lift. The wing stall resulted in an appreciable reduction of aileron effectiveness during the transition. Out of ground effect the low horizontal tail did not appear to be in an adverse flow field as had been expected and showed no erratic changes in effectiveness; however, in ground effect a large nose-down moment was experienced by the model. It is concluded that the configuration is directionally stable and possesses positive dihedral effect throughout the transition, and the data show no signs of erratic flow at the vertical tails. (Author)

AD-258 268 Div. 9, 1
(26 June 61) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
STOL CHARACTERISTICS OF A PROPELLER-DRIVEN, ASPECT-RATIO-10, STRAIGHT-WING AIRPLANE WITH BOUNDARY-LAYER CONTROL FLAPS, AS ESTIMATED FROM LARGE-SCALE WIND-TUNNEL TESTS,
by James A. Weiberg and Curt A. Holzhauser. June 61, 57p. 14 refs. (Technical note no. D-1032)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1032.

DESCRIPTORS: *Short take-off planes, *Boundary layer control, Model tests, Wind tunnel models, Stability, Stability (Longitudinal), Stability (Lateral), Transport planes, Tests, Lift, *Flaps, Control surfaces, *Landing, *Take-off, Flight speeds, Power, *Aerodynamics, Boundary layer control systems, Dual rotation propellers, Aspect ratio, Airplane models.

Research presented relative to the take-off and landing distances possible with a conventional propeller-driven transport-type airplane indicated that if highly effective flaps were used in combination with large amounts of power to augment lift (STOL); the landing and take-off distances would be less than half of the distances for conventional operation. The study is based on the wind-tunnel tests of a model with BLC on the trailing-edge flaps and control surfaces. At the lowest speeds considered (about 50 knots), adequate longitudinal stability was obtained but the lateral and directional stability were unsatisfactory. At these low speeds the conventional aerodynamic control surfaces may not be able to cope with the forces and moments produced by symmetric as well as asymmetric engine power. This problem was alleviated by increasing control effectiveness by use of BLC. Further reductions in the landing and take-off speeds to obtain shorter distances probably will result in the need to supplement the aerodynamic controls, the need for counterrotating propellers, and possibly the need for interconnected shafting on the propellers. (Author)

AD-258 284 Div. 9, 2, 15
(23 June 61) OTS price $17.50

National Aeronautics and Space Administration, Washington, D. C.
TABLES OF Z FUNCTIONS FOR ATMOSPHERE ENTRY ANALYSES,
by Dean R. Chapman and Arline K. Kapphahn. 1961, 277p. incl. tables (Technical rept. no. R-106)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical rept. no. R-106.

DESCRIPTORS: Functions, *Tables, *Atmosphere entry, *Special functions, Planetary atmospheres.

Tables are presented of Z functions and related quantities for computing entry trajectories into planetary atmospheres. These tables form a supplement to the analyses previously published in An Approximate Analytical Method for Studying Entry Into Planetary Atmospheres, NASA TR R-11, 1959, and An Analysis of the Corridor and Guidance Requirements for Supercircular Entry Into Planetary Atmospheres, NASA TR R-55, 1959. The results apply to shallow entries of lifting and nonlifting vehicles of arbitrary mass and size having constant aerodynamic coefficients. Results for nonlifting vehicles also apply to steep entries into the earth's atmosphere. Tabular values for various entry angles cover the range of entry velocity from 1.0 to 3.0 times circular velocity, and the range of lift-drag ratio from -4 to +4. (Author)

AD-258 334 Div. 9, 15, 31
(22 June 61) OTS price $3.60

David Taylor Model Basin, Washington, D. C.
THE POTENTIAL FUNCTIONS FOR SINGULARITIES ASSOCIATED WITH HYDROFOILS OF FINITE SPAN MOVING WITH SUBCRITICAL AND SUPERCRITICAL VELOCITIES IN SHALLOW WATER,
by Avis Borden. June 61, 31p. incl. illus. tables. (Rept. no. 1351)
Unclassified report

DESCRIPTORS: *Hydrofoils, *Hydrodynamics, Fluid mechanics, *Potential theory, Vortices, Mathematical analysis.

Singularities for a semi-infinite vortex sheet and a horizontal line doublet, both of finite span, may be used to represent the vorticity and displacement produced by a finite span hydrofoil. The boundary conditions which must be satisfied when these singularities move in shallow water are derived. Expressions for the potential functions are obtained for both the subcritical and supercritical ranges of Froude number. Explicit expressions for the x-, y-, and z-derivatives of the potential functions are also presented. Methods for determining the strengths of the singularities are discussed. (Author)

AD-258 343 Div. 9
(23 June 61) OTS price $3.60

Minnesota U., Minneapolis.
HEAT FLUX PROBE FOR DYNAMIC MEASUREMENTS IN HIGH TEMPERATURE GASES,
by L. M. Fingerson and P. L. Blackshear. May 61, 24p. illus. 10 refs. (Proj. Squid Technical rept. no.MIN-2-P)
(In cooperation with James Forrestal Research Center, Contract Nonr-185825, Proj. NR-908-038)
Unclassified report

DESCRIPTORS: *Temperature, Fluid flow, Heat transfer, Temperature sensitive elements, *High temperature research, *Anemometers, Measurement, Gases, Gas flow.

AD-258 344 Div. 9
(23 June 61) OTS price $3.60

Minnesota U., Minneapolis.
CHARACTERISTICS OF HEAT FLUX METER FOR USE IN HIGH TEMPERATURE ATMOSPHERES,
by L. M. Fingerson and P. L. Blackshear. Feb 61, 29p. incl. illus. (Proj. Squid Technical rept. no. MIN-1-P)
(In cooperation with James Forrestal Research Center; Contract Nonr-185825, Proj. NR-098-038)
Unclassified report

DESCRIPTORS: *Temperature, Measurement, *Combustion, Gas flow, Heat transfer, *High temperature research, Temperature sensitive elements, *Anemometers, *Fluxmeters, Tests.

A heat flux meter has been designed to measure dynamic properties in combustion gases. The operating principle is essentially that of a hot-wire anemometer with constant temperature operation. By using a film-type probe and adding a heat sink (cooling fluid), the operating range has been extended to include combustion environments. Frequency response is very good, the amplitude under the test conditions reported being 1 db down at 70,000 cycles per second. A secondary result of the cooling is improved frequency response for low heat transfer rates between the probe and the environment. (Author)

AD-258 348 Div. 9
(26 June 61) OTS price $2.60

Michigan U. Coll. of Engineering, Ann Arbor.
STAGNATION POINT FLUCTUATIONS ON BODIES OF REVOLUTION WITH HEMISPHERICAL NOSES,
by A. M. Kuethe, W. W. Willmarth, and G. H. Crocker. Final rept. June 60, 26p. incl. illus. tables (Rept. no. 02753-2-F)
(Contracts AF 49(638)336, AF 33(616)6856, and AF 33(616)7628)
(AFOSR TR 60-65) Unclassified report

DESCRIPTORS: *Bodies of revolution, Axially symmetric flow, *Boundary layer, Turbulent flow, *Turbulence, Anemometers, Reynolds number, Mach number, Velocity, Aerodynamics, Supersonics, *Heat transfer, Hemispherical shells.

The turbulent fields outside of the boundary layer near the noses of axially symmetric bodies with hemispherical noses were studied by means of the hot-wire anemometer. Measurements in a low turbulence wind tunnel over a range of Reynolds numbers show that the rms streamwise fluctuations in the nose region are larger than in the free stream. Large negative spatial correlation factors between streamwise fluctuations at plus or minus 7 deg from the axis at low speeds and in a supersonic tunnel at Mach 2.45 indicate that the fluctuations in the nose region are coupled with a random motion of the stagnation point. The normalized energy spectra of the fluctuations at 7 deg are found to scale with the free stream wave number. These normalized spectra also show a shift toward lower frequencies compared with free stream turbulence. Possible connection between these phenomena and heat transfer measurements from bodies as affected by turbulence are pointed out. (Author)

10. FUELS AND COMBUSTION

AD-257 616 Div. 10, 9, 27
(14 June 61) OTS price $1.10

Sheffield U. (Gt. Brit.).
RESEARCH ON RECIRCULATION WITHIN ROCKET COMBUSTION CHAMBERS,
by M. W. Thring. Final summary rept. 1 Sep 58-31 Aug 60, 31 Aug 60, 7p.
(Contract AF 61(052)150)
(ARL TR 60-338) Unclassified report

DESCRIPTORS: *Rocket motors, *Combustion chambers, Liquid rocket propellants, *Combustion, Phase studies, Vaporization, *Fluid flow, *Gas flow, *Combustion chamber gases, Photographic analysis, Tracer studies, Fuel additives, Fuel injectors.

The initial concept of a dynamically scaled model of an element of a real liquid fueled rocket combustion chamber incorporating phase change was developed. Photographic evidence of the recirculation patterns in this model were obtained. These patterns suggested that a live motor would have to be built to check the scaling laws and pattern similarity. Evidence from the cold model suggested some mechanisms for unstable combustion. (Author)

AD-257 620 Div. 10
(14 June 61) OTS price $14.00

Rohm and Haas Co., Huntsville, Ala.
THE MODIFIED WAGON WHEEL GRAIN DESIGN,
by Max W. Stone. 15 May 61, 1v. incl. illus. tables (Rept. no. S-30)
(Contract DA 01-021-ORD-11878)
Unclassified report

DESCRIPTORS: *Propellant grains, *Solid rocket propellants, Design, Combustion, Configuration, Mathematical analysis, Surfaces, Tables, Digital computers, Programming.

A modification of the wagon wheel grain design is considered in which short spears or spokes of propellant alternate with longer ones, and in which 3 different webs give rise to a 3-level

surface-time history. There are 6 possible combinations of these webs under the limitation that the outer web must always be equal to or greater than either of the other 2. This report discusses the analysis for the case where W1 (major web) is greater than W2 (1/2 the thickness of the short spoke) is greater than W3 (1/2 the thickness of the long spoke), and presents tabulated data resulting from the solution for a wide range of parameters of the equations which characterize the design. (Author)

AD-257 742 Div. 10, 30
(16 June 61) OTS price $2.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
RESEARCH ON SPECTROSCOPIC FLAME ANALYSIS (REPORTS 2-6),
by Ishita Yoshihei. May 61. 22p. incl. illus. tables (Technical notes no. FRL TN 73; Trans. from Nippon Kagaku Zasshi 76:56-63 (1955); 77: 238-244 (1955))
Unclassified report

DESCRIPTORS: *Flames, Temperature, *Spectrographic analysis, Test methods, Gases, Calcium compounds, Fluorides.

The arc light and flame methods of spectroscopic analysis were studied in detail, especially the latter. Temperature characteristics of flames produced by various fuels (acetylene, propane) and by various types of burner (Beckman, Perkin-Elmer) were determined and compared. The qualitative analysis of alkali elements by both the arc light and the flame methods was investigated, and disturbing (or obstructing) influences were studied. Ribbon and filament bulbs were compared as light sources. A separate study of band spectra of calcium fluoride is included. Relationships were found between the flow rate of the fuel and sensitivity of the spectrum, and between the wave length of the resonance line in the spectrum and the excitation voltage. (Author)

AD-257 817 Div. 10, 12
(16 June 61) OTS price $1.60

Space Technology Labs., Inc., Los Angeles, Calif.
TECHNICAL PLAN ERB 1-95 PHASE V TEST PROGRAM.
15 Mar 61, 17p. (Rept. no. STL/7102-0018-RU-000)
(Contract AF 04(647)619)
(AFBMD TR 61-35) Unclassified report

DESCRIPTORS: Guided missiles, Rocket propulsion, Rocket oxidizers, Rocket propellants, *Liquid rocket propellants, Liquefied gases, Handling, Ground support equipment, *Valves, Fuel tank vents, Propellant tanks, *Fuel systems, Test methods, Test facilities, Motion, Vibration, Tests, Oxygen, Oxygen equipment.

A technical plan is presented for the ERB 1-95 Phase V test program. The ERB 1-95 Phase V program is intended (1) to develop a reliable liquid O boil-off valve configuration which will cause less vibration in the liquid O tank and associated propellant loading hardware, (2) to develop a more reliable and accurate propellant loading control system, such as differential pressure and other control systems, and loading control hardware, including the fuel liquid O tank instrumentation stillwells with loading sensors, and propellant loading control unit, and (3) to facilitate a more accurate determination of missile range by establishing the extent and effect, if any, of the missile tank movement caused by propellant loading, and by obtaining detailed information on the effect of fast loading rates on propellant characteristics. Two propellant loading tests will be made with the Convair D series propellant loading system at operational loading rates. A series of high rate liquid O tanking tests will be made.

AD-257 906 Div. 10, 26
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div. Washington, D. C.
IMPROVEMENT OF CRACKED KEROSENE.
4 May 61. 1p. (AID rept. 61-60, Trans. from Catalytic Improvement of Kerosene by Thermal Cracking; Khimiya I Tekhnologiya Topliv I Masel 2:16-20, Feb 61)
Unclassified report

DESCRIPTORS: *Fuels, Jet engine fuels, Aviation fuels, Fuel oil, Petroleum, *Kerosene, *Hydrocarbons, *Petroleum industry, Production, Processing, Fractionation, Separation, Catalysts, Catalysis, USSR, Chemical engineering.

Catalytic improvement of the properties of cracked kerosene is recommended on the basis of laboratory and pilot-plant studies. Cracked kerosene, which boils between 174 and 300 C and which contains a high percentage of unstable hydrocarbons can be converted into a diesel fuel, The fuel meets the requirements of Soviet standards, except for its low flash point of 28 C (a minimum of 35 C is required). The flash point can be raised by distilling off the head fraction to 165 C. The suggested treatment consists in heating the cracked product to 260-300 C over an alumosilicate catalyst. For a continuous process the use of a fluidized bed is recommended. (Author)

AD-257 907 Div. 10
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div. Washington, D. C.
(No title)
4 May 61, 2p. (AID rept. 61-62, Trans. from Spontaneous Combustion, Flame, and Detonation in Gases; Moskva, Akademiya Nauk SSSR: 427p, 1960)
Unclassified report

DESCRIPTORS: Gases, *Combustion, Detonation, *Flame propagation, Shock waves, Pressure, Acceleration, USSR.

AD-257 920 Div. 10
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
STUDY OF COMBUSTION IN HIGH-SPEED GAS FLOW ABOUT

A PLATE.
23 May 61, 3p. incl. illus. (AID rept. no. 61-80, Trans. from Gas Flow about a Plate with Combustion of the Gas Occurring at the Surface of the Plate; Inzhenernofizicheskiy Zhurnal 4:39-45, Mar 61).

Unclassified report

DESCRIPTORS: *External combustion, *Sheets, *Gas flow, Combustion, Boundary layer, Superaerodynamics, Hypervelocity vehicles, Re-entry vehicles, Aerodynamic heating, *Surface temperatures.

This article may be of interest to the aerospace program, since it deals with flow regimes of bodies moving through the atmosphere at high velocities. It is one of a series of Soviet papers on aerodynamic and thermal characteristics of geometrical shapes immersed in low-density flow. The study of the flat-plate shape may be useful in the calculation of thermodynamic factors for a winged-entry glide vehicle with sharp leading edges. (Author)

AD-258 050 Div. 10
(21 June 61) OTS price $2.60

Louvain U. (Belgium).
EXPERIMENTAL INVESTIGATION OF IONIZATION PROCESSES IN FLAMES,
by A. Van Tiggelen. Annual summary rept. May 61, 23p. incl. illus. tables.
(Contract AF 61(052)398; continuation of Contract AF 61(514)1099)
(ARL-68) Unclassified report

DESCRIPTORS: *Flames, *Ionization, *Ions, Methanes, Methanols, Formaldehyde, Formic acids, Oxygen, Hydrocarbons, Acetylenes, Ethylenes, Nitrogen compounds, Ammonia, Separation, Mass spectrometers, Mass spectroscopy, Chemical analysis, Electrical conductance, Gas ionization, Plasma physics, Fuels.

New data were obtained in the identification of the ions produced in some flames. The presence of ions in the CH_4 and CH_3OH flames with oxygen and their absence in CH_2O and HCOOH flames with oxygen indicated the importance of the formation of a double carbon-oxygen bond in the primary process of chemi-ionization. Construction is reported of new equipment (1) extract the ions of flames which will be burning at atmospheric pressure, and (2) to improve the sensitivity and the resolving power of the analyzing part of the mass spectrometer. The conductivity method used in the laboratory, for the measurement of the total ionization in the flames, was modified. (Author)

AD-258 229 Div. 10
(26 June 61) OTS price $11.50

AeroChem Research Labs., Inc., Princeton, N. J.
MECHANISMS OF PRODUCTION AND REMOVAL OF ELECTRONS IN FLAMES,
by H. F. Calcote. Final rept. on Ions in Flames. Dec 60, 1v. incl. illus tables, 42 refs. (Rept. no. TP-24)
(Contract AF 04(647)157)
(AFBMD TR 61-54) Unclassified report

DESCRIPTORS: Rocket fuels, *Flames, Reaction kinetics, Ionization, Gas ionization, Electrons, *Ions, *Exhaust gases, *Exhaust flames, Mass spectrometers, Mass spectroscopy, Radiofrequency, Rocket motors, Fuels, Electromagnetic properties, Thermodynamics, Dissociation, Chemical reactions, Combustion, Acetylenes, Propanes, Hydrocarbons, Ethylenes, Recombination reactions, Pressure, Temperature.

The mechanism of ion formation and removal in hydrocarbon and some other flames was studied by Langmuir probes and RF mass spectrometry down to 1 mm Hg. A mass spectrometric technique was developed which permits ion profiles through the flame to be obtained with a high degree of spatial resolution and a minimum disturbance to the flame. The major ion is H_3O^+, with $C_3H_3^+$ being next in concentration. The results were interpreted in terms of chemiionization, e.g., CH + O yields $CHO^+ + e^-$. The rate in ions/cc x sec) of ion formation in hydrocarbon-air flames (equivalence ratio, R equals 0.88) is about 6 x 10 to the 9th power (p squared), where p is in mm Hg. This reaction is followed by the very rapid ion-molecule reaction: $CHO^+ + H_2O$ yields $H_3O^+ + CO$, so that the half-life of the initially produced ion is about 10 to the -7th power seconds. The decay of ion concentration downstream from the flame is used to calculate the recombination coefficient which for propane-air (R equals 0.88) is 2 x 10 to the -7th power cc/sec and independent of pressure.

AD-258 231 Div. 10, 27
(23 June 61) OTS price $3.60

Polytechnic Inst. of Brooklyn, N. Y.
A SPRAY COMBUSTION MODEL WITH DROPLET BREAKUP INCLUDING GAS DYNAMIC COUPLING,
by S. Burstein, S. Hammer, and V. D. Agosta. June 61, 35p. incl. illus. 12 refs.
(Contract AF 49(638)165, Proj. 9751)
(AFOSR-433) Unclassified report

DESCRIPTORS: *Sprays, *Fuel sprays, Injection, Injectors, *Liquid rocket propellants, Rocket oxidizers, Rocket fuels, Jet engine fuels, Oxygen, Liquefied gases, *Drops, Combustion chambers, Mathematical analysis, Rocket motors, *Combustion, Gas flow, Evaporation, Fluid mechanics, Model tests, Combustion chamber gases, Velocity, Vaporization, Diffusion, Theory.

A simplified model is proposed for the combustion of a bi-propellant spray. The model considers 2 subsystems, the spray, and the combusted gases. These subsystems are coupled together by heat transfer, mass transfer and momentum transfer. The solution of the problem relies upon the integration of a system of 7 nonlinear differential equations. Under the given boundary conditions a co-operative evaporation process occurs, in which increased velocity gradients cause increased evaporation which increases the velocity gradient. Tests were made on a 2-in. diam, variable length rocket motor, using JP-5A and LOX. A simple converging diverging nozzle is employed to give high chamber exit Mach numbers (.4 to .5). For a given set of injection parameters, under stable operating conditions, the results indicate that the steepest portion of the gradient, which corresponds to evaporation of the major portion of the fuel, is always found in a fixed region of the chamber, independent of the absolute length of the chamber. Results appear to be in agreement with the theory. (Author)

AD-258 326 Div. 10, 27
(23 June 61) OTS price $2.60

Naval Ordnance Test Station, China Lake, Calif.
EVALUATION OF PROPELLANT DEFECTS USING TRANS-

PARENT ROCKET MOTORS,
by Henry T. Sampson. Mar 61, 20p. incl. illus. tables (Rept. no. NOTS TP 2635)
(NAVWEPS rept. no. 7630) Unclassified report

DESCRIPTORS: *Rocket motors, *Solid rocket propellants, *Propellant grains, Igniters, Bonding, Rocket cases, Ignition, *Combustion, Plastics, Flame propagation, High speed photography, Photographic analysis, Test facilities, Model tests, Fracture (Mechanics), Rocket igniters, Pressure, Thrust, Transparent panels, Acrylic resins.

A transparent motor tube loaded with solid propellant has proved useful as a tool for studying problems of motor operation. Forty transparent motors were fired in a test program for the purpose of evaluating improper case bonding, cracked grains, and igniter operation. Conditions under which side burning occurs in improperly case-bonded motors were determined, and the rate of side burning in 2- and 5-inch motors was calculated. The ignition process and the performance of an igniter were observed, using a transparent half-motor. High-speed film records of side burning and cracked-grain burning were obtained, and 100-pps binary-coded timing (BCT) was used to obtain accurate correlation of pressure, thrust, and film records. (Author)

AD-258 332 Div. 10
(23 June 61) OTS price $2.60

Bureau of Mines, Pittsburgh, Pa.
COMPUTED COMPOSITIONS AND THERMODYNAMIC PROPERTIES OF DEUTERIUM-AIR FLAMES.
by Edwin B. Cook and Robert W. Smith, Jr.
June 61, 21p. incl. tables (Technical rept. BUM-31-R)
(Proj. SQUID; In cooperation with James Forrestal Research Center, Contract Nonr-185825)
Unclassified report

DESCRIPTORS: *Flames, Combustion, Air, Deuterium, Chemical reactions, Mathematical analysis, Thermodynamics, Numerical analysis, Tables.

11. GROUND TRANSPORTATION EQUIPMENT

No Entries

12. GUIDED MISSILES

AD-257 643 Div. 12
(16 June 61) OTS price $12.50

Aeronutronic, Newport Beach, Calif.
LAUNCH SITING CRITERIA FOR HIGH-THRUST VEHICLES,
by J. J. Oslake, S. Dobrin and others. Final technical rept. no. 4 (Final). 31 Mar 61, 145p. incl. illus. tables (Technical rept. no. U-108: 118)
(Contract N123(61756)23304A)
Unclassified report

DESCRIPTORS: *Guided missiles, Launching, *Rockets, *Hazards, Acoustics, Booster rockets, Explosions, Toxicity, Design, *Satellite vehicles, Propellants, Rocket motor noise, Selection, Propagation, Structures, Physiology, Airframes, Detonation, Atmosphere, Diffusion, Climatic factors, Exhaust gases, Deflection, *Launching sites, Attitudes.

A comprehensive technique for determining the magnitude of potential launch hazards is developed as an intermediate step in the process of selecting optimum launch sites for very high-thrust booster engines. Three characteristic launch site hazards are considered: acoustics, explosions, and toxicity. The siting criterial developed are generally applicable to most potential launch sites. In order to illustrate the site selection procedure a hypothetical three stage launch vehicle (9 million pounds thrust), and a prospective launch area with realistic environmental conditions are postulated. The resulting hazard estimates are employed to specify a particular launch complex location and configuration, and to establish launching constraints imposed by the assumed environment. Several field surveys are found necessary to provide critical data about potential launch sites for the assessment of hazards. Two of these, an acoustical measurement program and gas release tests, are described. (Author)

AD-257 689 Div. 12, 2
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SELECTED ARTICLES FROM SCIENCE AND LIFE.
1 Sep 60, 17p. (Trans. no. MCL-700 from Nauka I Zhizn' 4:pp. 58-64; 66-67, 1960)
Unclassified report

DESCRIPTORS: *Spaceships, *Space flight, Stars, Theory, *Relativity theory, *Flying platforms, Design, USSR, Astronautics.

Contents:
Flight to the stars
Flying platform

AD-257 775 Div. 12, 2
(16 June 61) OTS price $8.60

Northrop Corp., Hawthorne, Calif.
HYPERENVIRONMENT SIMULATION. PART II. DEVELOPMENT AND DESIGN OF SIMULATION FACILITIES FOR SPACE AND VEHICLE ENVIRONMENT,
by T. M. McCoy. Dec 60, 83p. incl. illus. tables.
(Contract AF 33(616)6679, Proj. 1309)
(WADD TR 60-785, pt. 2) Unclassified report

DESCRIPTORS: *Space environmental conditions, Scientific research, Spaceships, Atmosphere, Space flight, Astronautics, *Planetary atmospheres, *Upper atmosphere, Moon, Van allen radiation belt, Ionosphere, Stratosphere, Simulation, *High altitude, Re-entry aerodynamics, Thermal radiation, Solar spectrum, Test facilities, Design, Vacuum systems, Hypervelocity yehicles.

The approach, concept, design, and cost of hyperenvironmental simulation facilities for evaluating effects of space vehicle environment on specimens up to 250 pounds are summarized. With the objective of combining environment variables wherever applicable and feasible, four

basic facilities were conceived with several environments each. As part of the design back-up, some of the problems, methods and techniques of simulation are discussed. A summary is also given of the pertinent results of some experiments conducted to prove design feasibility in certain critical areas of simulation. (Author)

AD-257 797 Div. 12, 19
(16 June 61) OTS price $.75

National Aeronautics and Space Administration Washington, D. C.
THEORY OF ARTIFICIAL STABILIZATION OF MISSILES AND SPACE VEHICLES WITH EXPOSITION OF FOUR CONTROL PRINCIPLES,
by R. F. Hoelker. June 61, 22p. incl. illus. table (NASA Technical note D-555)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical Note D-555.

DESCRIPTORS: *Stabilization, *Satellite vehicles, *Guided missiles, Accelerometers, Angle of attack indicators, Guidance, Damping, Theory, Mathematical analysis, *Control systems, Gyro stabilizers, Guided missile trajectories, Drift, Differential equations, Aerodynamics, Satellite vehicle trajectories, Manned.

The theory of artificial stabilization of missiles and space vehicles in propelled flight is derived by a more rigorous method than has been done in the past. The relationship between the rotary loop and path loop in their reactions to artificial stabilization schemes is emphasized. The path reaction modes are classified by setting them into relation to two singular solutions, the drift minimum and load minimum modes. Two interesting other control modes are developed, concerned with local lateral acceleration along the missile axis. These are the maximum comfort control mode and the method of controlling the center or hinge point of the motion resulting from the combination of the rotary with the path motion. (Author)

AD-257 798 Div. 12, 9
(16 June 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMIC FORCE CHARACTERISTICS OF A SERIES OF LIFTING CONE AND CONE-CYLINDER CONFIGURATIONS AT A MACH NUMBER OF 6.83 AND ANGLES OF ATTACK UP TO 130 DEGREES,
by Jim A. Penland. June 61, 45p. incl. illus. table, 16 refs. (NASA Technical note D-840)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-840.

DESCRIPTORS: *Aerodynamics, *Conical bodies, *Cylindrical bodies, *Hypersonics, Test methods, Tests, Model tests, Lift, Drag, *Re-entry aerodynamics, Atmosphere entry, Strain gages, Mathematical prediction, Satellite vehicle trajectories, Mathematical analysis, Guided missiles trajectories, *Re-entry vehicles, Hypersonic flow.

Force tests of a series of right circular cones having semivertex angles ranging from 5 to 45 degrees and a series of right circular cone-cylinder configurations having semivertex angles ranging from 5 to 20 degrees and an afterbody fineness ratio of 6 have been made in the Langley 11-inch hypersonic tunnel at a Mach number of 6.83, a Reynolds number of 0.24 x 10 to the 6th power per inch, and angles of attack up to 130 degrees. An analysis of the results made use of the Newtonian and modified Newtonian theories and the exact theory. A comparison of the experimental data of both cone and cone-cylinder configurations with theoretical calculations shows that the Newtonian concept gives excellent predictions of trends of the force characteristics and the locations with respect to angle of attack of the points of maximum lift, maximum drag, and maximum lift-drag ratio. Both the Newtonian and exact theories give excellent predictions of the sign and value of the initial lift-curve slope. (Author)

AD-257 801 Div. 12
(15 June 61) OTS price $1.75

National Aeronautics and Space Administration, Washington, D. C.
ANALYTICAL EVALUATION OF A METHOD OF MIDCOURSE GUIDANCE FOR RENDEZVOUS WITH EARTH SATELLITES,
by John M. Eggleston and Robert S. Dunning. June 61, 61p. incl. illus. table (NASA Technical note D-883)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-883.

DESCRIPTORS: *Satellite rendezvous vehicles, Guidance, *Orbital flight paths, Mathematical analysis, Control systems, Simulation, Digital computers, Doppler radar, Velocity, Satellite vehicle trajectories.

A digital-computer simulation was made of the midcourse (or ascent) phase of a rendezvous between a ferry vehicle and a space station. The simulation involved a closed-loop guidance system in which both the relative position and relative velocity between ferry and station are measured (by simulated radar) and the relative-velocity corrections required to null the miss distance computed and applied. The results are used to study the effectiveness of the guidance equations and the effects of errors in launch conditions and errors in the navigation (radar) data. Trajectories are presented for rendezvous with a space station in a circular orbit and in an elliptic orbit. (Author)

AD-257 802 Div. 12, 10, 13, 25
(15 June 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
AN INVESTIGATION OF THE NATURAL FREQUENCIES AND MODE SHAPES OF LIQUIDS IN OBLATE SPHEROIDAL TANKS,
by H. Wayne Leonard and William C. Walton, Jr. June 61, 24p. incl. illus. table (NASA Technical note D-904)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-904.

DESCRIPTORS: *Fluid mechanics, *Guided missiles, *Spaceships, *Fuel tanks, Vibration, Frequency, *Vibration mechanics,

Spheres, Bodies of revolution, Oscillation, Liquid rocket propellants, *Harmonic oscillators, Photographic analysis.

An experimental investigation was conducted to gain some understanding of the character of the free vibration modes of liquids in oblate spheroidal tanks applicable in missile and space vehicle systems. Measured natural frequencies were obtained for the lowest three or four antisymmetric modes of oscillation as a function of the liquid depth for three orientations of each of several such tanks of different size and oblateness. The frequency data are presented as dimensionless parameters developed for each orientation to permit the application of the experimental results to the prediction of the natural frequencies of tanks of different size and oblateness. Photographs were made of representative surface wave or mode shapes for each orientation. (Author)

AD-257 803 Div. 12, 9
(15 June 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMIC CHARACTERISTICS AT A MACH NUMBER OF 3.10 OF SEVERAL FOURTH-STAGE SHAPES OF THE SCOUT RESEARCH VEHICLE,
by Byron M. Jaquet. June 61, 17p. incl. illus. table (NASA Technical note D-916)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-916.

DESCRIPTORS: *Aerodynamics, *Supersonics, Wind tunnel models, Tests, Research test vehicles, Strain gages, Aerodynamic configurations, Conical bodies, Cylindrical bodies, *Guided missile noses, Model tests, Moments, *Satellite vehicles, Satellite vehicle research, Staging.

A wind-tunnel investigation was made at a Mach number of 3.10 (Reynolds number per foot of 16.3 x 10 to the 6th power to 16.9 x 10 to the 6th power) to determine the aerodynamic characteristics of various modifications of the payload section of the fourth stage of the Scout research vehicle. It was found that, for the combination of stages 3 and 4, increasing the size of the nose of the basic Scout to provide a cylindrical section of the same diameter as the third stage increased the normal-force slope by about 30 percent, the axial force by about 39 percent, and moved the center of pressure forward by about one fourth-stage base diameter. By reducing the diameter of the cylinder, at about one nose length behind the base of the enlarged nose frustum, to that of the basic Scout and thereafter retaining the shape of the basic Scout, the center of pressure was moved rearward by about one-half fourth-stage base diameter at the expense of an additional 19-percent increase in axial force. A spike-hemisphere configuration had the largest forces and moments and the most forward center-of-pressure location of the configurations considered. (Author)

AD-257 804 Div. 12, 1
(15 June 61) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
A FIXED-BASE-SIMULATOR STUDY OF THE ABILITY OF A PILOT TO ESTABLISH CLOSE ORBITS AROUND THE MOON,
by M. J. Queijo and Donald R. Riley. June 61, 53p. incl. illus. table (NASA Technical note D-917)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-917.

DESCRIPTORS: *Space flight, Control systems, Manned, Pilots, Space probes, *Lunar probes, Guidance, *Flight instruments, Simulation, *Orbital flight paths, Guided missile trajectories, Satellite vehicle trajectories, Moon, Tests.

A study was made on a six-degree-of-freedom fixed-base simulator of the ability of a human pilot to modify hyperbolic ballistic trajectories of a space vehicle approaching the moon so as to establish a circular orbit 50 miles above the lunar surface. The pilot was given control of thrust along the vehicle's longitudinal axis and torques about all three body axes. The results showed that by using a hodograph presentation of rate of descent and circumferential velocity, an altimeter, and vehicle attitude and rate meters, the pilots could consistently establish final altitude and velocity combinations that result in orbits lying within an altitude range of 10 to 90 miles above the lunar surface with a fuel consumption from 1 to 3 percent of the initial vehicle mass more than that required by the two-impulse Hohmann maneuver. (Author)

AD-257 840 Div. 12, 17, 22, 26
(19 June 61) OTS price $11.50

AVCO Corp., Nashville, Tenn.
DESIGN, DEVELOPMENT AND FABRICATION OF A LIGHT WEIGHT AIRFRAME,
Final rept. 31 Mar 61, 1v. incl. illus. tables. (Contract DA 33-008-ORD-1968, Proj. TN2-8106)
Unclassified report

DESCRIPTORS: *Airframes, *Guided missile noses, Rocket noses, Aluminum alloys, Honeycomb cores, Bonding, Welding, Surfaces, Design, Manufacturing methods, Tensile properties, Explosive forming, Production, Aerodynamic configurations, Quality control, Tests, Stresses, Mathematical analysis, Ogives, Tools, Machine tools, Sandwich construction, Load distribution, Specifications.

The light weight airframe structure consists of a tangent ogive of 195.0-inch radius 48 inches long. The diameter of Sta. 48.0 is 12 inches. The design was based on an aluminum honeycomb construction which design studies had shown best satisfied the optimum requirements of weight, shell stability, aerodynamic smoothness, deflection and strength criteria. Work included the investigation of fabrication procedures in adhesive bonding systems, welding, and forming, as well as the tooling and fabrication of 5 airframes, representing 3 configurations plus spare parts. Conclusions reached indicate that the advantages to be realized from an aluminum honeycomb sandwich structure in the design of a light weight airframe include: (1) efficient structure, (2) resistance to fatigue and vibration, (3) adaptability to quantity production, (4) smooth aerodynamic surfaces, and (5) maximum payload. (Author)

Division 12 - GUIDED MISSILES

AD-257 911 Div. 12, 2
(22 June 61) OTS price $1.60

Library Services Section, Air Information Div.
Washington, D. C.
THERMODYNAMICS AND SURFACE EFFECTS OF SPACECRAFT AND SATELLITES. SELECTED BIBLIOGRAPHY.
19 May 61, 10p. 43 refs. (AID rept. 61-67)
Unclassified report

DESCRIPTORS: *Spaceships, *Space flight, *Thermodynamics, Satellite vehicles, Meteors, Hazards, USSR, Celestial mechanics, Manned, *Bibliography, Space medicine, Cooling.

A bibliography is presented of references on thermodynamics and surface effects of spacecraft and satellites. The entries given in alphabetical order by author are not otherwise classified. The bibliography covers the period from 1957 to 1961. (Author)

AD-257 938 Div. 12, 9, 25
(21 June 61) OTS price $6.60

Rand Corp., Santa Monica, Calif.
THEORY OF IONIZED TRAILS FOR BODIES AT HYPERSONIC SPEEDS,
by P. S. Lykoudis. 29 May 61, 66p. incl. illus.
(Research memo. no. RM-2682)
(Contract AF 49(638)700, Proj. Rand)
Unclassified report

DESCRIPTORS: Guided missiles, *Re-entry vehicles, Aerodynamic configurations, Hypersonics, Atmosphere, *Re-entry aerodynamics, Aerodynamics, Wake, Gases, *Gas ionization, Thermodynamics, Fluid mechanics.

The characteristics of the gaseous trail remaining behind a body moving through the atmosphere at hypersonic speeds are discussed. Means are sought for ascertaining those variables that can be measured and used to predict the characteristics of the body causing the trail, essentially its shape and weight. In the case of thermodynamic equilibrium, a universal solution is found for the velocity and enthalpy distributions at a station behind the body where the pressure has reached its ambient free-stream value. This solution is given in terms of the coordinate defining the shape of the bow shock wave. The nondimensional velocity and enthalpy profiles depend strongly on the drag coefficient alone. The Thermal-conduction part of the trail is also studied. An analytic solution is found for the case of variable thermal conductivity. The length of the trail based on a minimum ionization level is calculated at different altitudes for an illustrative re-entry. Within a good approximation this length is directly proportional to the local atmospheric density, to the drag coefficient, and to the objects's cross-sectional area, for a constant flight velocity and for a relatively blunt body with boundary-layer effects neglected. The influence of the trailing shock on the conduction part of the trail is discussed. A preliminary study is also made of the trail under chemically frozen conditions. (Author)

AD-258 000 Div. 12, 8
(21 June 61) OTS price $12.00

Aberdeen Proving Ground, Md.
ENVIRONMENTAL TEST OF PERSHING COMMUNICATIONS PACK NO. 1,
by Ray L. Wiles. June 61, 1v. incl. illus. tables
(Report no. DPS-244)
Unclassified report

DESCRIPTORS: *Communication equipment, Tests, Test methods, Voice communication systems, *Climatic factors, Air conditioning equipment, Teletype equipment, Multiplex transmission, Intrumentation, Antenna masts, Ground support equipment, *Guided missiles, *Surface to surface, *Shelters, Generators, Electric power production, Vibration mechanisms.

The communications pack, a self-contained component of the Pershing missile system ground support equipment, was subjected to a wide range of environmental conditions including climatic phases of rain, wind, high and low temperatures, humidity and icing; table vibration consisting of a low-input resonance search in the three major axes; and a road-shock and vibration test at various road speeds over the 6-inch washboard, level paved and ramp courses. While several problem areas were noted, the communications system would still transmit and receive at the conclusion of the test. It was recommended that action be taken to correct the shortcomings encountered and that an improved version be subjected to further testing. (Author)

AD-258 020 Div. 12
(21 June 61) OTS price $1.60

Friez Instrument Div., Bendix Aviation Corp.,
Baltimore, Md.
DESIGN AND DEVELOPMENT OF A REMOTE SETTING MINIATURE BAROSWITCH AND SETTER FOR USE IN GUIDED MISSILE ADAPTION KITS,
by L. C. Friend and K. D. Shaub. Rept. no. 7,
1 Feb-31 Mar 61, 5p. incl. illus.
(Contract DA 36-034-ORD-3284, Proj. TN 2-8106)
Unclassified report

DESCRIPTORS: *Pressure switches, Barometric pressure, Remote control systems, *Guided missile fuzes, Adapters, *Arming devices, Servomechanisms, *Miniature fuzes, Design, *Sliding contacts, Effectiveness.

Research was continued to: (1) determine effectiveness of the setting linkages and adjustments in the baroswitch setting mechanism; (2) construct and test a prototype of the remote setting machanisms; and (3) refine the baroswitch and setter designs for improved performance and manufacturability. Tests of settable elements indicated that linearity and settability of the element are acceptable, and that temperature error is substantially constant for all settings. The adjustments provided for element zero-setting and ranging are adequate. A prototype assembly of the baroswitch housing and setting servomechanism was completed. Backlash and driving torque values are as expected. (Author)

AD-258 069 Div. 12
(19 June 61) OTS price $1.10

Friez Instrument Div., Bendix Aviation Corp.,
Baltimore, Md.
DESIGN AND DEVELOPMENT OF A REMOTE SETTING MINIATURE BAROSWITCH AND SETTER FOR USE IN GUIDED MISSILE ADAPTION KITS,
by L. C. Friend and K. D. Shaub. Rept. no. 8,
1-30 Apr 61. 30 Apr 61, 5p. incl. illus.
(Contract DA 36-034-ORD-3284, Proj. TN2-8106)
Unclassified report

DESCRIPTORS: *Pressure switches, Barometric pressure, *Guided missile warheads, Remote control systems, Servomechanisms, Adapters, Sliding contacts, Electric switches, Tests, *Guided missile fuzes, Diaphragms (Mechanics), Design.

Design of the baroswitch was essentially completed. Setting accuracy of the baroswitch loop is better than + or - 0.25 millibars. Weight of the unit is approximately 1.35 lbs. The servo loop comprised by the setter circuits and the mechanisms within the baroswitch is adequate for its intended function as now designed. (Author)

AD-258 299 Div. 12
(26 June 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
TRANSONIC WIND-TUNNEL INVESTIGATION OF THE FIN LOADS ON A 1/8-SCALE MODEL SIMULATING THE FIRST STAGE OF THE SCOUT RESEARCH VEHICLE,
by Thomas C. Kelly. June 61, 28p. incl. illus. (Technical note no. D-918)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-918.

DESCRIPTORS: Wind tunnel models, Simulation, Model tests, *Aerodynamics, Tests, Test methods, *Fins, Space probes, Strain gages, *Research test vehicle, *Transonics, Staging, Design, Roll, *Load distribution.

An investigation to determine the fin loads on a 1/8-scale model simulating the first stage of the Scout research vehicle was made in the Langley 8-ft transonic tunnel at Mach numbers from 0.40 to 1.20. Tests were conducted over an angle-of-attack range from about -10 to + 10 degrees and at a Reynolds number per ft of approximately 3.5 x 10 to the 6th power. Results of the tests indicate that for a given angle of attack, negative tip-control deflections caused decreases in normal-force and fin-bending-moment coefficients and increases in pitching-moment coefficient, as would be expected. The effects were slight at a model angle of attack of -10 degrees where tip-control stall had probably occurred but increased with an increase in angle of attack. (Author)

13. INSTALLATIONS AND CONSTRUCTION

AD-257 930 Div. 13, 5, 7, 10, 26
(21 June 61) OTS price $1.60

Science and Tech., Section, Air Information Div., Washington, D. C.
SOVIET LITERATURE ON PROTECTIVE STRUCTURES AND COMPONENTS.
Monthly rept. no. 1, 1 Dec 60-1 Jan 61.
28 Apr 61, 13p. incl. illus. (AID rept. 61-63)
Unclassified report

DESCRIPTORS: USSR, *Construction, Insulating materials, Thermal insulation, Soils, Heat transfer, Measurement, Earth augers, Drilling machines, Coal, Rock, Reinforced concrete, Design, Mobile, *Mining engineering, Seismic waves, Propagation, Power plants, Steam power plants, Gas turbines, Generators, Structures, Electric power production, Underground structures.

Construction methods: Methods of determining thermophysical characteristics of heat-insulating materials; Shaft-sinking machine; Hydraulic structures and works, foundations, excavation work, and machines; One hour instead of 24 (coal-mining machine); Special mining jobs; Construction and bracing of mines; Seismoacoustic studies in coal mines; Transportable building-block 750 and 1500 kw steam turbine units; and An important means of propagating and introducing advanced experience (gas turbine generator).

AD-258 246 Div. 13, 3, 20
(20 June 61) OTS price $4.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
DOSE ATTENUATION FACTORS FOR CONCRETE SLAB SHIELDS COVERED WITH FALLOUT AS A FUNCTION OF TIME AFTER FISSION,
by L. K. Donovan and A. B. Chilton. 1 June 61, 30p. incl. illus. table (Technical rept. no. 137)
(Proj. Y-F011-05-329)
Unclassified report

DESCRIPTORS: *Concrete, *Shelters, Shielding, Underground structures, *Radioactive fall-out, Gamma rays, *Dose rate, Attenuation, Nuclear explosions, Nuclear warfare, Radiological warfare, Radiological dosage, Thickness, Fission, Time, Countermeasures, Civilian defense systems, Atomic bomb explosions, Radioactive decay, Dosage.

A study was made to investigate the dose attenuation of fallout gamma radiation by various thicknesses of concrete roofs of buried fallout shelters as a function of time after a nuclear detonation. A spectrum of energies is used for the fallout source rather than a single average energy as has been done in previous studies. Dose attenuation factors are derived and presented as a function of the above parameters. The Office of Civil and Defense Mobilization recommends a two-week shelter-stay time in the event of a nuclear attack; therefore, also presented is an average dose attenuation factor for any fourteen-day stay time as a function of time of arrival of the fallout or of shelter-entry time, for various roof thicknesses. (Author)

AD-258 262 Div. 13
(19 June 61) OTS price $8.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
COLUMN STRENGTH OF LONG PILES,
by J. J. Hromadik. Final rept. 3 May 61. 88p. incl. illus. tables (Technical rept. no. 133)
(Proj. Y-F015-10-305)
Unclassified report

DESCRIPTORS: *Foundations (Structures), Beams, Mechanical properties, Failure (Mechanics), Test equipment, Tests, Buckling, Steel, Reinforced concrete, Design, Theory, Deformation, Deflection, Load distribution, Stresses, *Piers, Equations, Statistical analysis.

Full-scale axial load tests were conducted on six different types of commercially available piles to determine their resistance against failure by buckling. A total of seventeen 80-foot specimens, each with an unsupported length of 60 feet or more, were tested under conditions

of piles at refusal. A field test tower with a loading system induced axial compressive loads to 440 tons. Tests and results are presented. Application of tangent modulus principles for use in the generalized Euler equation for predicting buckling loads is demonstrated by way of examples. It is concluded that the theory has practical application, and its usage is recommended. (Author)

AD-258 321 Div. 13
(23 June 61) OTS price $2.60

IMC Magnetics Corp., Westbury, Long Island, N. Y.
DEVELOPMENT OF COOLING DEVICE IN ACCORDANCE WITH BUREAU OF SHIPS CONTRACT SPECIFICATION SHIPS-B-3575, DATED 11 JAN, 1960.
Interim development rept. for 13 June-30 Sep 60. 30 Sep 60, 22p. incl. illus. table.
(Contract NObsr-81526)
Unclassified report

DESCRIPTORS: *Cooling fans, Electric motors, Cooling, Blowers, Shipborne, Naval equipment, Specifications, Design, Theory, *Air conditioning equipment.

Investigations were continued in the development of a cooling device to be used in the forced air cooling of electronic equipment. It was concluded that: (1) the pressure and flow as specified for the size and speed limitations cannot be met, (2) the maximum flow obtainable for the specified system using the entire available space with the exception of the 1-3/4 in. inlet tube is slightly less than half of the required flow, and (3) to obtain the specified performance conditions using this airmover the speed should be increased to slightly more than twice the present speed. (Author)

14. MATERIALS (NON-METALLIC)

AD-257 683 Div. 14
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
GLASS AND CERAMICS (SELECTED ARTICLES).
17 Feb 61, 10p. incl. illus. (Trans. no. MCL-663 from Steklo i Tseramika 2:pp. 28-31; 47, Feb 60)
Unclassified report

DESCRIPTORS: USSR, *Glass textiles, *Plastics, Insulating materials, Thermal insulation, Acoustic insulation, Electric insulation, Production, Industrial production, Borohydrides, Substitutes, *Ceramic materials, Esters, Polymers, Resins, Economics, Porous materials.

Contents:
Certain technical problems in the manufacture of glass fibers and glass plastics, by M. G. Chernyak
Porous permeable ceramics, by R. L. Pevzner

AD-257 707 Div. 14, 26
(15 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INVESTIGATIONS OF NEW TYPES OF PLASTICS,
by I. A. Bikson and A. N. Petrova. 10 Jan 61, 5p. incl. illus. (Trans. no. MCL-765 from Khimicheskoye Mashinostroyeniye 4:pp. 28-29, 1960)
Unclassified report

DESCRIPTORS: *Plastics, Polymers, *Ethylenes, *Propenes, Physical properties, Mechanical properties, Tensile properties, Elasticity, Stability, Heat tolerance, Oxidation, Welding, Bonding, Welds, Sheets, Laminates, Processing, USSR, Adhesion, Bonded joints.

The continuous increase in the selection of plastic materials for replacing non-ferrous metals and expensive alloys is cited. Certain types of polymer materials possess the properties which permit them to be used in many branches of the national economy. Polyethylene and polypropylene belong to this group and are reported in research conducted at the Scientific Research Institute of the Chemical Industry. (Author)

AD-257 731 Div. 14, 1, 12
(16 June 61) OTS price $15.00

Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATION OF FEASIBILITY OF UTILIZING AVAILABLE HEAT-RESISTANT MATERIALS FOR HYPERSONIC LEADING-EDGE APPLICATIONS. VOLUME VI. DETERMINATION AND DESIGN APPLICATION OF MECHANICAL PROPERTIES OF BARE AND COATED GRAPHITE,
by Alfred Rudnick, Robert L. Carlson, and George K. Manning. Rept. for Dec 58-May 60 on Ceramic and Cermet Materials, and Construction Techniques and Application of New Materials. Nov 60, 213p. incl. illus. tables, 25 refs.
(Subcontract to Bell Aerosystems Co., Buffalo, N. Y.; Contract AF 33(616)6034)
(WADC TR 59-744, vol. 6) Unclassified report

DESCRIPTORS: *Refractory materials, *Hypervelocity vehicles, Satellite vehicles, Hypersonics, Design, High temperature research, *Graphite, Brittle materials, Mechanical properties, Refractory coatings, Coatings, Ceramic materials, Ceramic coatings, Graphite compounds, Gliders, *Wings, Materials, Fracture (Mechanics), *Silicon coatings, Stresses, Deformation, Tests, Temperature, Silicon compounds, Carbides, Nitrides, Tensile properties.

The results of a study on the mechanical properties of a siliconized Grade ATJ graphite are presented. The mechanical properties were studied as functions of temperature (to 2950 F), strain rate, size, and stress state. Supplementary studies were conducted to determine the room-temperature properties of the uncoated material and the degree of anisotropy of both the coated and uncoated material. Gross variations in the material tended to obscure the effects of the parameters under consideration. With proper selection of material quality, the siliconized Grade ATJ graphite may be used effectively as a structural component at elevated temperature in an oxidizing atmosphere. (Author)

AD-257 732 Div. 14, 1, 12, 17
(16 June 61) OTS price $14.00

Bell Aerosystems Co., Buffalo, N. Y.
INVESTIGATION OF FEASIBILITY OF UTILIZING

AVAILABLE HEAT RESISTANT MATERIALS FOR HYPERSONIC LEADING EDGE APPLICATIONS. VOLUME VII-OXIDATION RESISTANCE OF BARE AND COATED MOLYBDENUM ALLOY AND GRPHITE,
by Donald J. Powers, John A. Dickson and others.
Rept. for July 58-July 60 on Ceramic and Cermet Materials, and Construction Techniques and Application of New Materials. Dec 60, 192p. incl. illus. tables.
(Contract AF 33(616)6034, Proj. nos. 7350 and 1368)
(WADC TR 59-744, vol. 7) Unclassified report

DESCRIPTORS: Refractory materials, Heat resistant alloys, *Hypervelocity vehicles, Hypersonics, High temperature research, *Molybdenum alloys, Titanium alloys, *Graphite, Coatings, Oxidation, Silicon coatings, *Refractory coatings, Ceramic materials, *Wings, Design, Tests, Test facilities, Test methods, Gliders, Materials, Aerodynamic heating, Plasma jets, Heating, Ceramic coatings.

Results are presented of oxidation resistance tests of bare and coated 0.5% Ti alloy of Mo and ATJ graphite. Chromalloy W-2 and Durak MG coatings were evaluated on the Mo alloy while the ATJ graphite was coated by the National Carbon Company's siliconizing process. Tests were conducted in 5 different facilities including 3 arc plasma jets at temperatures from 2000 to 3400F and times from 1 min to 4 hr. Both uncoated materials reacted exothermically under oxidizing conditions. A high degree of failures were encountered on all coated specimens. (Author)

AD-257 789 Div. 14
(16 June 61) OTS price $4.60

Naval CIvil Engineering Lab., Port Hueneme, Calif.
WATER VAPOR TRANSMISSION OF PLAIN CONCRETE,
by D. F. Griffin and R. L. Henry. 16 May 61, 49p. incl. illus. tables (Technical rept. no. 130)
(Proj. Y-R011-01-025)
Unclassified report

DESCRIPTORS: *Concrete, *Reinforced concrete, Reinforcin steel, Steel, Water vapor, Corrosion, Penetration, Humidity, Sodium compounds, Chlorides, Additives, Water, Transmission, Test equipment, Test methods, Failure (Mechanics), Fracture (Mechanics), Mechanical properties, Porosity.

Studies were conducted to measure water vapor permeability of concrete and relate it to corrosion of embedded steel; to investigate salt whisker crystal growth on concrete; and to measure electrical resistivity of concrete. The effects of water-cement ratio, relative humidity, aggregate size, concrete slice position, and certain admixtures such as oleic acid and NaCl on the permeability of plain concrete were investigated. Salt whisker crystal growth on specimens with NaCl as an admixture is discussed. Water vapor transmission values were found to be significantly higher for higher water-cement ratios, smaller aggregate, and the absence of NaCl. Concrete slice position, oleic acid, and relative humidity were found to have no significant effect. The study demonstrates that water vapor transmission is not directly proportional to water vapor pressure differentials between the ends of the flow path. (Author)

AD-257 823 Div. 14, 12, 20, 27
(15 June 61) OTS price $7.60

Stanford Research Inst., Menlo Park, Calif.
EFFECTS OF RADIATION ON FERROELECTRIC AND FERRIMAGNETIC MATERIALS. PART I. FERROELECTRIC MATERIALS,
by L. G. Wright, C. A. Rosen, and S. I. Taimuty.
Final rept., pt. 1. 1 May 61, 71p. incl. illus. tables, 21 refs.
(Contract AF 19(604)4141)
(AFCRL-351) Unclassified report

DESCRIPTORS: *Ferroelectric crystals, *Ferroelectric materials, Barium compounds, Titanium compounds, Oxides, Lead compounds, Calcium compounds, Zirconium compounds, Intermetallic compounds, Ceramic materials, Dielectrics, Dielectric properties, Hysteresis, Radiation damage, Gamma rays, Neutron bombardment, Neutrons, Polarization, Test facilities, Space environmental conditions, Nuclear propulsion, Ferromagnetic materials, Heat treatment, Aging, *Titanates.

The effects of reactor radiation and Co-60 gamma radiation on the dielectric properties of 4 ceramic ferroelectric materials (BaTiO3, 96% BaTiO3 plus 4% PbTiO3, 95% BaTiO3 plus 5% CaTiO3, and 56% PbZrO3 plus 44% PbTiO3) were studied. Complex permittivity and large-signal hysteresis properties were measured before and after irradiation, after room temperature aging, and after 500 C heat treatment. The effects on the dielectric constant were small after fast-neutron exposures below 10 to the 18th power n/sq cm. After 10 to the 18th power n/sq cm, decreases in the values of the dielectric constants were observed with the passage of time. The total hysteresis loss at constant maximum electric displacement increased, and the changes in the hysteresis loops were large only in the samples exposed to 10 to the 18th power n/sq cm. The changes in the gamma-irradiated samples were similar to but smaller than those in the neutron-irradiated samples.

AD-257 867 Div. 14, 4, 8
(20 June 61) OTS price $8.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
BIBLIOGRAPHY AND TECHNICAL REVIEW OF RUTILE (TiO2),
by Lewis E. Hollander, Jr. and Patricia L. Castro.
Rept. on Communications. Mar 61, 88p. 259 refs.
(Rept. no. LMSD-894803)
Unclassified report

DESCRIPTORS: *Titanium compounds, Patents, *Dioxides, *Bibliography, Single crystals, Crystal structure, Oxidation, Dielectrics, Reduction, Electrical properties, Resonance, Microwave amplifiers, Films.

Contents:
Crystal growth and preparation techniques
Crystal structure
Oxidation and reduction studies of the titanium-oxygen system
Dielectric properties
Electrical properties
Resonance, Maser, and microwave effects
Elastic moduli
Films
Suboxides of titanium
General survey papers
Patents utilizing the oxides of titanium for electronic applications

Division 14 - MATERIALS (NON-METALLIC)

AD-257 917 Div. 14, 12, 20
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
HIGH-TEMPERATURE- AND OXIDATION-RESISTANT MATERIALS.
19 May 61, 2p. (AID rept. 61-74, Trans. from Protection of Carbon and Graphite from Oxidation at Temperatures up to 1200 C; Zhurnal Prikladnoy Khimii 34:505-512, Mar 61)
Unclassified report

DESCRIPTORS: *Carbon, *Graphite, Oxidation, High temperature research, *Ceramic coatings, Coatings, *Refractory coatings, *Silicon coatings, Oxidation inhibitors, Molybdenum compounds, Silicides, Silicon compounds, *Enamel coatings, Carbides, Aluminum compounds, Borides, Oxides, Glass, Binders, Deterioration, Reentry vehicles, Guided missiles, Nuclear reactions, USSR, Aerodynamic heating.

A study of the protection of carbon and graphite materials from oxidation in air at elevated temperatures is reported. The method of protection consisted in coating the surfaces of the materials to be protected with mineral enamels. The enamels tested were composed of a high-refractory powdered material cemented together and bonded to the carbon surface by a glasslike binder melted directly on the specimen. Molybdenum silicide or silicon carbide, either alone or in combination, were tested with four different binders. The best results were obtained with molybdenum silicide and binder 238, which consists of 80% Si02, 2.5% Al203, and 17.5% B203. The technique of application consisted of covering the specimens with a three-layer coating of the slip, drying, and firing at 1200-1600 C in an argon atmosphere. The high-quality glass-silicide coatings can prevent the oxidative destruction of carbon and graphite materials for at least 100 hours at temperatures up to 1200 C. (Author)

AD-257 960 Div. 14, 4
(20 June 61) OTS price $1.10

Harris Research Labs., Washington, D. C.
ACCELERATED DETERIORATION OF TEXTILES,
by Charles A. Rader and Anthony M. Schwartz.
Bimonthly progress rept. no. 1, 1 Apr-31 May 61. 15 June 61, 6p.
(Contract DA 18-108-cml-6606)
Unclassified report

DESCRIPTORS: *Textiles, *Deterioration, Aging, Measurement, Cellulose, Catalysts, Physical properties, Light, Oxidation, Photolysis, *Photochemical reactions, Fibers, Military equipment, Clothing.

The textile deterioration program encompasses studies on the accelerated degradation of the various important textile fibers encountered in military apparel and material. The object of these studies was to measure, quantitatively, the photocatalytic effect of ferric ion on the oxidative degradation of cellulose. Cellophane was chosen as the substrate, rather than the woven cellulosic fabrics used previously, for the following reasons: (1) With cellophane it is possible to measure accurately the amount of catalyst needed to cause a given degree of degradation. Even deposition of catalyst can be achieved in cellophane, but is practically impossible to attain in the woven fabrics. (2) The simpler structure of cellophane enables accurate measurement of the amount of light needed to cause degradation. Practically all of the light falling on the cellophane is absorbed, reflected specularly, or transmitted, with very little scattering. Since it has been shown that as little as 0.004% ferric ion in a cotton fabric can accelerate photooxidative degradation of the cotton, it is expected that longer exposure times will produce degradation of the treated cellophane. (Author)

AD-258 042 Div. 14, 17
(19 June 61) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
A COMPARISON OF THE BRITTLE BEHAVIOR OF METALLIC AND NONMETALLIC MATERIALS,
by G. T. Hahn and R. I. Jaffee. 16 May 61, 33p. incl. illus. tables, 52 refs. (DMIC memo. no. 107)
Unclassified report

DESCRIPTORS: *Brittle materials, *Metals, Alloys, *Ceramic materials, *Plastics, Tensile properties, Physical properties, Mechanical properties, Deformation, Fracture (Mechanics), Crystal structure, Elasticity, Plasticity, Fatigue (Mechanics), Thermal stresses, Stresses, Design.

The nature and properties of brittle metallic and nonmetallic materials are compared in an attempt to develop a common basis for the design of tensile structures. Deformation and fracture are dependent on electron bonding, crystal structure, and the degree of order; these characteristics influence the strength and ductility parameters used by design engineers. Properties of brittle materials of importance in design include elasticity, plastic deformation, fracture, notch sensitivity, energy absorption, fatigue, and thermal-shock resistance. These properties of metals, ceramics, composite materials (reinforced plastics) and polymers are compared. Many similarities exist in the properties of metals and nonmetallics subject to brittle behavior. Ductility, notch sensitivity, and energy-absorption data indicate that nonmetallics are more susceptible to cracking and fracture than brittle metals. Design philosophies are discussed on transition-temperature; crack-propagation, and brittle material.

AD-258 070 Div. 14, 4
(20 June 61) OTS price $3.60

Forest Products Lab., Madison, Wis.
SUITABILITY OF SOME PACIFIC COAST WOODS FOR PRINTING PAPERS,
by D. J. Fahey and J. S. Martin. Apr 61, 1v. incl. tables (Rept. no. 2200)
(In cooperation with Simpson Timber Co., and Wisconsin U.)
Unclassified report

DESCRIPTORS: Trees, *Wood, *Paper industry, Density, Sulfate pulps, Physical properties, Chemical properties, Cellulose chemistry, Tests, *Wood pulp, *Paper, Bleaching agents, Test methods, Growth, Tensile properties, Printing, Effectiveness.

An investigation was made of the relative suitability of several Pacific coast softwoods and hardwoods in the manufacture of duplicating and offset printing papers. The woods tested were old-growth and second growth Douglas-fir (Pseudotsuga menziesii) and black cottonwood (Populus trichocarpa), the more common species

used in the Pacific Northwest for this type of paper, and western hemlock (Tsuga heterophylla), western redcedar (Thuja plicata), ponderosa pine (Pinus ponderosa), bigleaf maple (Acer macrophyllum), Pacific madrone (Arbutus menziesii), red alder (Alnus rubra), and tanoak (Lithocarpus densiflorus). The density of the softwood species ranged from 22.3 pounds per cubic foot for western redcedar to 26.8 for western hemlock. The density of the hardwood species ranged from 20.1 pounds for black cottonwood to 35.6 for tanoak. Chemical analyses and fiber length measurements were made on the wood from each sample. (Author)

AD-258 071 Div. 14, 16, 32
(20 June 61) OTS price $3.60

Forest Products Lab., Madison, Wis.
WETWOOD, BACTERIA AND INCREASED pH IN TREES,
by Carl Hartley, Ross W. Davidson, and Bowen S. Crandall. Apr 61, 35p. incl. illus. table, 106 refs. (Rept. no. 2215)
(In cooperation with Wisconsin U.)
Unclassified report

DESCRIPTORS: Hydrogen ion concentration, *Bacteria, *Trees, Moisture, *Plants, Oxidation, Minerals, Resistance, Decomposition, Gases, Diseases, Chlorophylls, Mechanical properties, Life expectancy, Diffusion, *Cellulose chemistry.

Heartwood formation coincides with the natural death of the parenchyma due to its age, or as in oak to its distance from the cambium. In the pines, Douglas-fir, oaks, and some other common trees, heartwood is more acid than sapwood, and in the pines and Douglas-fir, it is lower in moisture. Both heartwood and sapwood of healthy tress are thought of as ordinarily free from micro-organisms except for the heart-rotting Hymenomycetes or local infections near wounds. For the most important commercial genera, there is little reason to challenge this view. Mechanical wounds, frost cracks, and branch stubs are apparently common ports of entry. Wetwood has been found following winter killing of sapwood, but this is not common. The familiar brown slime flux at pruning wounds usually originates from wetwood previously established in the tree, rather than from the effects of organisms working at the surface of the wound from which the flow issues. The frequent association with shake and frost cracks may also mean that the wetwood is a factor in the initiation or extension of these conditions. (Author)

AD-258 072 Div. 14, 4
(20 June 61) OTS price $3.60

Forest Products Lab., Madison, Wis.
PULPING AND PAPERMAKING EXPERIMENTS ON CERTAIN PINES OF MEXICO AND CENTRAL AMERICA,
by E. R. Schafer and G. H. Chidester. Apr 61, 1v. incl. tables (Rept. no. 2217)
(In cooperation with Wisconsin U.)
Unclassified report

DESCRIPTORS: *Wood pulp, *Paper industry, Physical properties, Tests, Calcium compounds, Sodium compounds, Sulfate pulp, Peroxides, Zinc compounds, Bleaching agents, Solvent extraction, Production, *Cellulose chemistry, Analysis, Wood pulp machines, Processing.

This report discusses (1) the groundwood pulping and the making of newsprint paper from a mixture of nine species of pine from Mexico including Pinus oocarpa, P. leiophylla, P. pseudostrobus, P. teocote, P. montezuma, P. lawsoni, P. pringlei, P. tenuifolia, and P. michoacana; (2) groundwood and sulfate pulping and the making of newsprint, wrapping, writing, and tissue papers from P. oocarpa received from the Republic of Honduras; and (3) groundwood and sulfate pulping experiments on P. caribaea from British Honduras A mixture of the nine species, however, produced a groundwood pulp suitable for the making of newsprint paper. Bleaching experiments made on the groundwood pulp produced from the mixture of pines included comparisons between Ca(O Cl)2, H2O2, ZnS2O4, and NaS2O4. The brightness stability obtained was about equal for the last three chemicals. Based on the amounts required, bleaching with Ca(O Cl)2 would be the most expensive. Papermaking experiments included the use of the groundwood pulp in the bleached and unbleached condition combined with commercial semi-bleached or fully bleached sulfate pulps. Newsprint papers comparable in strength and in most properties to average commercial newsprint were made that contained 80% of groundwood and 20% of sulfate pulp. (Author)

AD-258 073 Div. 14, 26
(20 June 61) OTS price $1.60

Forest Products Lab., Madison, Wis.
EFFECT OF CONDITION AND KIND OF WOOD ON GROUNDWOOD PULP QUALITY,
by Earl R. Schafer. Apr 61, 18p. incl. tables (Rept. no. 2220)
(In cooperation with Wisconsin U.)
Unclassified report

DESCRIPTORS: Wood pulp, Density, Physical properties, Decomposition, Moisture, Storage, *Wood, *Ecology, Paper industry, Cellulose, Tropical regions, Tests, Fibers, Plants, Diseases, Insects, Fires, Quality control, Production, Processing.

This report discusses the properties and conditions of wood that have major effects on the quality of groundwood pulp, including the effect of density, the presence of compression wood, tension wood and heartwood, the effects of fire char decay, storage and moisture content, and the differences between dead standing timber and live timber. The groundwood pulping characteristics of softwoods and hardwoods are also discussed and typical data on the groundwood pulps obtained from a number of domestic and foreign species are given. (Author)

AD-258 092 Div. 14, 20, 25
(23 June 61) OTS price $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
ULTRAVIOLET AND VACUUM EFFECTS ON INORGANIC UTERIALS. AN ANNOTATED BIBLIOGRAPHY,
comp. by Robert C. Gex. Apr 61, 33p. 73 refs.
(Special bibliography no. SB-61-19)
Unclassified report

DESCRIPTORS: *Inorganic substances, *Radiation damage, *Bibliography, *Coatings, Materials, Spaceships, Guided missiles, Ultraviolet radiation, Optics, *Thin films, Space environmental conditions, Optical coatings.

A selected list of 73 annotated references are presented on the effects of the vacuum and ultraviolet on inorganic materials. Primarily the

effects reported in the literature are on the optical properties of inorganic films. Emphasis was placed on recent literature, from 1958 on. The references are arranged alphabetically by author; an index by material is also provided. Sources used were Physics Abstracts, Chemical Abstracts, Ceramics Abstracts, Engineering Index, Nuclear Science Abstracts, ASTIA, and LMSD card catalog. (Author)

AD-258 180 Div. 14
(27 June 61) OTS price $10.10

General Electric Co., Schenectady, N. Y.
HIGH TEMPERATURE INSTRUMENT OIL,
by Albert A. Schwartz, Harry R. Broadley, Jr. and Robert S. Norman. Rept. for 1 July 59-30 June 60 on Aviation Lubricants. Dec 60, 114p. incl. illus. tables.
(Contract AF 33(616)5894, Proj. 3044)
(WADD TR 59-633, pt. 2) Unclassified report

DESCRIPTORS: *Lubricants, *Oils, Bearings, Silicones, *Instrument greases, Lubricant additives, Friction, Gimbals, Lubrication, Ball bearings, Physical properties, Chemical properties, Oxidation inhibitors, Greases, High temperature research, Exosphere, Oxidation.

Studies were made on lubricity improvers and oxidation inhibitors for silicone fluids. Full scale performance tests in instrument bearings were run both in air and in an argon atmosphere. Evaluation of the base stock, the most promising fluid formulation, and the vendor-developed dry lubricated ball bearing was carried out in a simulated gyro gimbal assembly and in high speed gyro motors designed to operate at 400 F. Significant improvement over the silicone base oil was obtained with the oil compounded with a lubricity improver, especially in the slow speed gimbal tests. Lubrication of the high speed gyro motors with these lubricants was not as satisfactory as the slower speed application. The dry lubricated bearings appear promising for moderate to high speed applications, such as the tachometer generator, where torque requirements are not critical. These bearings did not prove to be satisfactory in the gyro gimbal test since bearing torque increased rapidly during the first 200 hr of operation. (Author)

AD-258 257 Div. 14, 29
(19 June 61) OTS price $2.60

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
BALLISTIC PROTECTIVE BOUYANT MATERIALS,
by Michael C. Jaskowski. Quarterly rept. no. 4, 1 Aug 60-13 Jan 61. 3 Mar 61, 21p. incl. illus. table.
(Contract N140(138)68879B, Proj. 388-1)
Unclassified report

DESCRIPTORS: Materials, *Ballistics, *Buoyant materials, Dacron, Nylon, Orlon, Fibers, Safety, *Coating, Body armor, Protective clothing.

By using 1.0 dpf Orlon staple, the effect of surface treatments of the fibers upon ballistic performance was investigated. Agents which increased the normal fiber-to-fiber fraction decreased the limiting velocities of their carded batts. Of the materials tested, hydrophobed aerogel produced the most pronounced effect. A curve was prepared of areal density versus limiting velocity for 1.5 dpf Dacron staple, 3.0 in. cut, using carded batts at 0.5 in. thicknesses. This polyester fiber has the smallest diameter commercially available. A plot was also obtained for Dynel staple fiber showing the effect of fiber diameter (denier) upon ballistics. The deniers ranged from 0.6 to 24.0. As expected, the limiting velocity decreased with increasing denier. Significant upgrading of the ballistic performances of 1.0 dpf Orlon batts was not obtained as the result of incorporating nylon body armor into the structures. (Author)

AD-258 295 Div. 14, 8, 25
(22 June 61) OTS price $3.60

Hughes Aircraft Co., Culver City, Calif.
DEVELOPMENT OF IMPROVED THERMAL SHOCK RESISTANT DIELECTRIC MATERIALS FOR EMBEDDING ELECTRONIC COMPONENTS,
by J. B. Rust, R. G. Brault and R. F. Feuchtbaum. 10 Dec 60, 35p. incl. illus. tables (Rept. no. P61-01)
(Contract NObs-84027, continuation of Contract NObs-77054)
Unclassified report

DESCRIPTORS: Dielectrics, Thermal stresses, *Embedding substances, Electronic equipment, Plastics, *Silicone resins, Polymers, Aging, Benzenes, Silanes, Polymerization, Shock resistance, Heat resistant polymers, High temperature research, Synthesis, Additives, Dielectric properties, Casting, Temperature.

New polyhydridosilanes have been prepared which are capable of crosslinking commercial solentless silicone resins. Disilylbenzene has been successfully added to R65 yielding a fluid product which can be used as a crosslinking agent. Gelling of silicone resins with disilylbenzene has been found to be adversely affected by air. A method has been found to minimize the adverse effects of the reaction exotherm. Results of the weight loss studies at 300 and 350 C are reported. Specimens for the high temperature dielectric measurements have been prepared and aged. Several modifications of the test jig for this analysis have been explored and the final design is being fabricated. (Author)

15. MATHEMATICS

AD-257 640 Div. 15, 2, 12
(14 June 61) OTS price $2.60

Lincoln Lab., Mass. Inst., of Tech., Lexington.
ON DETERMINING THE RATIO BETWEEN THE AREA OF AN ELLIPTICAL SECTOR AND ITS TRIANGLE APPROXIMATION,
by R. Crittenden, E. Dubinsky, and H. D. Fridman. 18 May 61, 22p. incl. tables (Rept. no. 22 G-0052)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Orbital flight paths, Tables, Determination, Functions, Position finding, *Satellite vehicle trajectories, Guided missile trajectories, Trigonometry, *Geometry, Analytic geometry, Sequences, *Numerical analysis.

A fundamental problem in the estimation of satellite orbit parameters from two position measurements at different times is the computation of

the area of an elliptical sector defined by the two observations. Gauss' Method estimates the ratio of the area of the elliptical sector to that of an approximating triangle by an iterative method. The convergence of this procedure is tested empirically by using various examples. In addition, four techniques by which these ratios may be approximated are compared with the method of Gauss and with each other. (Author)

AD-257 717 Div. 15, 12, 25
(15 June 61) OTS price $2.60

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
TRUNCATIONS IN THE METHODS OF INTERMEDIATE PROBLEMS FOR LOWER BOUNDS TO EIGENVALUES,
by Norman W. Bazley and David W. Fox. Feb 61, 26p. (Rept. no. CM-991)
(Contract NOrd-7386; In cooperation with National Bureau of Standards, Washington, D. C.)
Unclassified report

DESCRIPTORS: *Operators (Mathematics), Mechanics, Quantum mechanics, *Integral equations, *Functional analysis, Matrix algebra, Algebra, Inequalities.

Two new procedures are presented for determining lower bounds to eigenvalues of semi-bounded self-adjoint operators. The procedures are based on the method of intermediate problems. While phrased in the language of Hilbert space, the procedures result in useful computational methods for the estimation of eigenvalues and eigenvectors of differential operators in classical and quantum mechanics. (Author)

AD-257 772 Div. 15
(16 June 61) OTS price $6.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
SIGNAL FLOW GRAPH ANALYSIS OF MECHANICAL ENGINEERING SYSTEMS,
by J. L. Burroughs and W. W. Happ. Technical rept. on Mathematics. Apr 60. 63p. incl. illus. tables. (Rept. no. 6-90-61-8)
Unclassified report

DESCRIPTORS: *Control systems, Mathematical analysis, Applied mathematics, *Topology, *Mechanics, *Thermodynamics, Beams, Gears, Mechanical engineering, Heat exchangers, Gas flow, Ramjet engines, *Structures.

A straightforward procedure for formulating the flow graphs of physical systems is explained and applied to mechanical, thermal, structural, and aerodynamic systems. Numerical and analytical results are obtained directly by visual inspection of the flow graphs. (Author)

AD-257 782 Div. 15
(16 June 61) OTS price $2.60

Institute of Mathematical Sciences, New York U., N. Y.
ASYMPTOTIC ESTIMATES FOR THE STURM-LIOUVILLE SPECTRUM,
by Harry Hochstadt. Feb 61, 26p. (Research rept. no. BR-36)
(Contract AF 49(638)229, Proj. 47500)
(AFOSR-276) Unclassified report

DESCRIPTORS: *Differential equations, *Transformations (Mathematics), *Numerical analysis, Integral equations.

It is shown that the differential equation $y'' + [\lambda + \Phi(x)]\, y = 0$ can, under suitable conditions, be solved by assuming a solution of the form $y = A(x) \sin \varphi(x)$ where

$$\varphi'(x) = \sqrt{\lambda + \Phi(x)} + 1/4 \frac{\Phi'(x)}{\lambda + \Phi(x)} \sin 2\varphi(x)$$

$$A'(x) = -A(x) \frac{\Phi'(x)}{2\lambda + 2\Phi(x)} \cos^2 \varphi(x).$$

Use of the first equation leads, when boundary conditions are applied, to asymptotic estimates of the eigenvalues. In particular, in the case of Hill's equation, it is shown that the instability intervals vanish faster than any inverse power of k, k being the order of the corresponding eigenvalues, when $\Phi(x)$ is an analytic function. (Author)

AD-257 816 Div. 15, 32
(15 June 61) OTS price $2.60

Rand Corp., Santa Monica, Calif.
METHODS OF SOLUTION OF LINEAR PROGRAMS UNDER UNCERTAINTY. NOTES ON LINEAR PROGRAMMING AND EXTENSIONS. PART 56.
by Albert Madansky. 6 Apr 61, 20p. (Research memo. no. RM-2752)
(Contract AF 49(638)700, Proj. Rand)
Unclassified report

DESCRIPTORS: *Linear programming, Matrix algebra, Games theory, Probability.

Most applied linear-programming problems involve uncertainty in either the technology matrix, the requirement vector, or the cost. Some of the more usual methods of reducing the effects of uncertainty are (1) replacing the random elements by their expected values, (2) replacing the random elements by pessimistic estimates of their values, and (3) recasting the problem into a two-stage program so that, in the second stage, one can compensate for inaccuracies in the activities of the first stage. These methods are called the expected-value solution, the fat solution, and the slack solution, respectively. The one-stage linear program is examined under uncertainty in some detail, pointing out the relation between these various solutions. (Author)

AD-257 830 Div. 15
(15 June 61) OTS price $2.60

Washington U., Seattle.
MEAN CONVERGENCE ON ORTHOGONAL SERIES AND CONJUGATE SERIES,
by Richard Askey. June 61, 20p.
(Contract AF 49(638)218)
(AFOSR-696) Unclassified report

DESCRIPTORS: *Series, Measure theory, Sequences, Functions, Polynomials, Inequalities, Integral transforms, Differential equations.

Division 15 - MATHEMATICS

AD-257 869 Div. 15, 8
(19 June 61) OTS price $1.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
A PROPERTY OF UNATE SWITCHING FUNCTIONS WITH AN APPLICATION TO LOGICAL DESIGN,
by M. A. Fischler. Technical rept. on Mathematics. May 60, 13p. (Rept. no. 6-90-61-5)
Unclassified report

DESCRIPTORS: Functions, *Mathematical logic, Algebra, Circuits, *Switching circuits, Linear systems, Design, Digital computers.

AD-257 981 Div. 15
(20 June 61) OTS price $8.60

Chicago U., Ill.
INTRODUCTION TO TOPOLOGY OF FUNCTIONAL SPACES,
by Andrzej Granas. May 61, 94p.
(Contract AF 18(600)1383, Proj. 9769C)
(AFOSR-680) Unclassified report

DESCRIPTORS: *Algebraic topology, *Topology, *Functional analysis, Algebra, Sequences, Vector analysis, Differential equations, Real variables, Functions, Integral equations.

Contents:
Compact and finite dimensional mappings
Compact vector fields and the homotopy extension theorem
Borsuk's antipodensatz
Simplex triangulation
Simplicial mapping
Essential and inessential compact fields
Theorem on antipodes
Continuous continuation method and fixed-point theorem
Theorem on the sweeping and Birkhoff-Kellogg theorem
Theorems on epsilon domains
Invariance of domain
Transformations of Banach space onto itself
Intersection theorem for Banach spaces
Theorem on disconnection of Banach spaces

AD-258 058 Div. 15
(21 June 61) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
A COHOMOLOGICAL LEMMA AND ITS APPLICATION,
by Stephen S. Shatz. 13 June 61, 11p. (Rept. no. 52G-0020)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Groups (Mathematics), *Algebraic topology.

The notion of cohomology of groups of Galois Type is extended to give a lemma on cohomological dimension. An application to the theory of elliptic curves is also given. (Author)

AD-258 214 Div. 15
(26 June 61) OTS price $2.60

Minnesota U. School of Business Administration, Minneapolis.
EXACT LOWER MOMENTS OF ORDER STATISTICS FOR SMALL SAMPLES FROM THE CHI-POPULATION (1.D.F.),
by Zakkula Govindarajulu and I. Richard Savage. Jan 61, 19p. incl. tables (Rept. no. 12)
(Contract Nonr-258200)
Unclassified report

DESCRIPTORS: *Statistical tests, Statistical distributions, Integrals, Sampling, Probability, Numerical analysis, Statistical functions, Tables, *Statistical analysis.

The expected values for samples to size four and the mixed and second moments (about the origin) for samples to size five, drawn from the chi-population (1 d.f., or with one degree of freedom) have been evaluated. Numerical values of these to eight decimal places are computed. Section 2 contains general formulae and some definite integrals used in the computation. The results in Section 3 have theoretical interest in showing the relationships between moments of order statistics from chi (1 d.f.) and the standard normal distributions. In Section 4, there is a discussion about the number of integrals required to evaluate the first, second and mixed moments of order statistics for each N, given these moments to (N-1) and the existence of the tables for the normal distribution. (Author)

AD-258 227 Div. 15, 25
(21 June 61) OTS price $3.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
ON THE APPLICATION OF TWO-PARTICLE DISTRIBUTION FUNCTIONS,
by J. M. Burgers. Apr 61, 29p. (Technical note no. BN-243)
(Contract AF 49(638)401)
(AFOSR-750) Unclassified report

Paper presented at the PBI Symposium on Electromagnetics and Fluid Dynamics of Gaseous Plasma, New York, April 4-6, 1961.

DESCRIPTORS: *Electrical conductance, Direct current, *Gas ionization, Integration, Integral equations, *Quantum mechanics, Velocity, Partial differential equations, Electric fields.

This analysis was conducted to derive an expression for the electric conductivity of a fully ionized gas by making use of the two-particle distribution function. Limitation of time makes it necessary to restrict to the simplest case, where the gas is subjected to a uniform time-independent electric field and magnetic fields are absent. The application of the two-particle distribution function is prompted by the hope that it will give a good evaluation of the aggregate effect of weak interactions, which in the case of Coulomb forces are more important than the effects of single collisions. The basic equation is the Boltzmann equation in which the usual expression for the effect of binary collisions is replaced by an integral depending upon the two-particle distribution function. (Author)

AD-258 233 Div. 15, 25
(22 June 61) OTS price $2.60

Israel Inst. of Tech., Haifa.
REAL AND COMPLEX DIFFERENTIAL SYSTEMS,
by Binyamin Schwarz. Final technical rept. Jan 61, 28p. incl. illus.
(Contract AF 61(052)323)
(AFOSR-640) Unclassified report

DESCRIPTORS: *Differential equations, *Vibration, *Rods, *Integral equations, Matrix algebra, Frequency.

This final report is divided into two independent parts: I. Some results on the frequencies of nonhomogeneous rods; II. On the least positive eigenvalue for two classes of integral equations. No results on complex differential systems were obtained. The research on integral equations is a natural continuation of former work on real differential systems. (Author)

AD-258 234 Div. 15
(22 June 61) OTS price $1.60

Hebrew U. (Israel).
LIMITS AT INFINITY OF SEMI GROUPS OF CONTRACTION, by S. R. Foguel. Jan 61, 12p. (Technical (scientific) note no. 13)
(Contract AF 61(052)187)
(AFOSR-654) Unclassified report

DESCRIPTORS: *Groups (Mathematics), *Operators (Mathematics), Statistical processes, *Functional analysis, Matrix algebra.

The behavior at infinity of semi groups of contractions in Hilbert space is discussed. Applications to Markov processes are indicated. (Author)

AD-258 235 Div. 15
(22 June 61) OTS price $1.10

Liege U. (Belgium).
RESEARCH IN HYPERBOLIC DIFFERENTIAL EQUATIONS, by Florent J. Bureau. Annual summary rept. no. 3, 15 Mar 60-14 Mar 61, 15 Mar 61, 4p.
(Contract AF 61(052)86)
(AFOSR 799) Unclassified report

DESCRIPTORS: *Partial differential equations, Integrals, Integration.

AD-258 236 Div. 15
(22 June 61) OTS price $1.60

Hebrew U. (Israel).
A SUBSPACE OF l^1 WHICH IS NOT ISOMORPHIC TO l^1, by Joram Lindenstrauss. Dec 60, 12p. (Technical (scientific) note no. 14)
(Contract AF 61(052)187)
(AFOSR-800) Unclassified report

DESCRIPTORS: *Functional analysis, Topology, Sequences, Operators (Mathematics), Algebra.

An example is given of a closed infinite-dimensional subspace of l^1 which is not isomorphic to l^1. (Author)

AD-258 237 Div. 15
(22 June 61) OTS price $1.60

Hebrew U. (Israel).
TAUBERIAN CONSTANTS FOR HAUSDORFF TRANSFORMATIONS, by Amnon Jakimovski. Feb 61, 16p. (Technical (scientific) note no. 15)
(Contract AF 61(052)187)
(AFOSR-801) Unclassified report

DESCRIPTORS: *Transformations (Mathematics), *Functional analysis, Integral equations, Matrix algebra, Sequences, *Series.

The existance of Tauberian constants is proved and their value is computed for a certain class of Hausdorff transformations. (Author)

AD-258 240 Div. 15, 25
(22 June 61) OTS price $3.60

Liege U. (Belgium).
ASYMPTOTIC BEHAVIOR OF THE SPECTRAL MATRIX OF THE OPERATOR OF ELASTICITY, by F. J. Bureau and E. J. Pellicciaro. Jan 61, 30p. (Technical (scientific) note no. 5)
(Contract AF 61(052)86; In cooperation with Delaware U., Newark)
(AFOSR-296) Unclassified report

Presented to the American Mathematical Society at its Sixty-Seventh Annual Meeting in Washington, D. C., January 23-26, 1961.

DESCRIPTORS: Elasticity, *Operators (Mathematics), Integral equations, Sequences, Partial differential equations, Matrix algebra, Integrals.

Let D be a bounded, open, and connected domain in R_3 with boundary D'; set $\vec{Lv} = b^2 \text{grad div } \vec{v} - a^2 \text{ rot rot } \vec{v}$ with a, b constant. The object of this paper is to find the asymptotic representation of the spectral matrix of the problem $\vec{Lv} + \lambda \vec{v} = 0$, $x \in D$, $\vec{v} = 0$, $x \in D'$, λ a parameter. If D' is sufficiently smooth, this problem determines a sequence $\{\lambda_k\}$ of positive eigenvalues such that $\lambda_k \to \infty$; when $k \to \infty$; each λ_k is associated with an eigenfunction $\vec{v}_k$ with components v_{kj}. Set $\sqrt{\lambda} = \mu$, $\sqrt{\lambda_k} = \mu_k$, and $\Theta^*(x; \mu) = \sum_{i=1}^{3} \Theta_{ii}(x,x; \mu)$. With the aid of a Tauberian theorem one arrives at the result

$$\Theta^*(x; \lambda) \sim \frac{1}{6\pi^2} \left(\frac{2}{a^3} + \frac{1}{b^3}\right) \lambda^{3/2}$$

(Author)

AD-258 249 Div. 15
(21 June 61) OTS price $2.60

Pennsylvania U., Philadelphia.
POINT TRANSITIVE TRANSFORMATION GROUPS, by Robert Ellis. 1961, 20p.
(Contract AF 49(638)569)
(AFOSR-517) Unclassified report

DESCRIPTORS: *Groups (Mathematics), *Transformations (Mathematics), *Topology, Algebras.

Let T be an abstract group, (beta T,T) the beta-compactification of T regarded as a transformation group with phase group T. The collection of all point transitive transformation groups (X,T) with compact phase space X is studied by representing each such X as a set of homomorphisms of certain subalgebras of C(beta T) into C(beta T). (Author)

Division 15 - MATHEMATICS

AD-258 250 Div. 15
(20 June 61) OTS price $2.60

Massachusetts Inst. of Tech., Cambridge.
ON HOMOTOPY ABELIAN H-SPACES,
by James D. Stasheff. May 61, 24p.
(Contract AF 49(638)42)
(AFOSR-587) Unclassified report

DESCRIPTORS: *Algebraic topology.

AD-258 307 Div. 15, 8
(26 June 61) OTS price $4.60

Radiation Lab., U. of Michigan, Ann Arbor.
SOME RELATIONS BETWEEN POTENTIAL THEORY AND THE WAVE EQUATION,
by D. A. Darling. Dec 60, 42p. (Rept. no. 2871-5-T)
(Contract AF 19(604)4993)
(AFCRL-39) Unclassified report

DESCRIPTORS: *Green's function, *Potential theory, Equations, Probability, Electrostatics, Matrix algebra, Electromagnetic waves.

Solutions to the Dirichlet and Neumann problems for the region exterior to the intersection of two regions whose individual electrostatic Green's functions are known are developed. The method is applied specifically to obtain solutions for the exterior of a solid finite circular cone with a spherical cap. The solutions to the vector and scalar wave equations for long wavelengths can be expressed in terms of these Dirichlet and Neumann solutions. (Author)

AD-258 335 Div. 15, 16, 28
(22 June 61) OTS price $1.60

Duntley, S. Q., La Jolla, Calif.
ANALYTIC VISUAL SEARCH CALCULATIONS,
by James L. Harris. Sep 60, 11p. (Rept. no. 5-10)
(Contract NObs-72039, Proj. NS 714-100)
Unclassified report

DESCRIPTORS: *Visual thresholds, Eye, Target recognition, Mathematical analysis, *Equations, Visibility, Detection.

An attempt was made to demonstrate the utility of analytic approximations in visual search analyses. This has been accomplished by choosing a simple example in which apparent contrast did not change with observer altitude and vertical downward line of sight was assumed. The use of analytic approximations are in no way restricted to these simple cases. With analytic expressions for visual thresholds, equations can be derived which describe area search rates for any combination of altitude, optical aid magnification, target area, and apparent target contrast. Equations can also be derived which describe the optimum optical aid magnification for a given altitude, target area, and apparent contrast. The analytic determination of optimum magnification makes it possible to define maximum area search rate attainable for a specified target area and apparent contrast. (Author)

16. MEDICAL SCIENCES

AD-257 652 Div. 16
(14 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
REACTIONS OF RETINAL NEURONS AFTER LIGHT FLASHES. II. DOUBLE FLASHES WITH CHANGING FLASH INTERVAL (Reaktionen Retinaler Neurone Nach Lichtblixen. II. Doppelblitze Mit Wechselndem Blitzintervall) by O. J. Gruesser and H. Kapp. Jan 61, 25p. incl. illus. 29 refs. (Trans. no. MCL-103 from Pflugers Archives 266:111-129, 1958)
Unclassified report

DESCRIPTORS: *Retina, *Nerves, Stimulation, Light, Inhibition, Reaction time.

Reactions of single retinal neurons after double-light flashes with a changing light interval of between 80 and 8 ms, or 500 and 8 ms, are described. For the reaction of retinal neurons, the Bunsen-Roscoe-Bloch law was found to be valid only in the first part (20-50%) of the critical time. The changes of latent periods and primary activation phases after double flashes were interpreted as a superposition of simultaneous synaptic inhibition and excitation processes. Schematic graphs of this interaction of activation and inhibition are shown. The receptor potential of single cones of the cat's retina during light flashes is described. It is concluded that later activation and inhibition phases at retinal neurons, which have been described, are the expression of interneuronal excitation and inhibition processes. (Author)

AD-257 712 Div. 16
(15 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
BIOLOGY OF COSMIC FLIGHTS (Biologiya Kosmicheskikh Poletov),
by O. G. Gazenko and V. B. Malkin. Oct 60, 15p. (Trans. no. F-TS-9899 from Nauka I Zhizn: pp. 17-21, Nov 58)
Unclassified report

DESCRIPTORS: *Space medicine, *Space flight, *Satellites, Physiology, Psychology, Stress (Physiology), Stress (Psychology), Survival.

AD-257 721 Div. 16, 13
(15 June 61) OTS price $5.60

Armed Forces Pest Control Board, Washington, D. C.
INSECT AND RODENT CONTROL.
Quarterly research and development rept. no. 52, Jan-Mar 61. Mar 61, 52p. incl. illus. tables, 18 refs.
Unclassified report

DESCRIPTORS: *Insects, *Arthropods, *Rodents, Insect control, *Rodenticides, *Insecticides, Insect repellants, *Pest control, Tests, Sharks, Control.

AD-257 737 Div. 16
(16 June 61) OTS price $2.60

Douglas Aircraft Co., Inc., El Segundo, Calif.
SOME NOTES ON THE PHYSIOLOGICAL TOLERANCE TO ACCELERATION,
by B. H. Levedahl. 20 Feb 61, 20p. incl. tables, 18 refs. (Rept. no. ES 40253)
(Contract Nonr-107600)
Unclassified report

DESCRIPTORS: *Acceleration tolerance, Man, Primates, Deceleration, Survival, Physiology, Fatigue (Physiology), Circulatory system, Blackout (Physiology), Ejection seats, Posture.

AD-257 762 Div. 16
(15 June 61) OTS price $1.10

Maryland U., College Park.
PATHOLOGY OF CHOLERA IN CHICK EMBRYOS AND THE DEVELOPMENT OF NON-SUSCEPTIBILITY,
by Gordon M. Ramm. Annual progress rept. 1 June 60-31 May 61. 31 May 61, 3p. incl. table. (In cooperation with Walter Reed Army Inst. of Research, Washington, D. C.)
Unclassified report

DESCRIPTORS: *Cholera, Pathology, Infections, Chickens, *Embryos, *Vibrio.

Differential susceptibility of chick embryos between eleven and sixteen days to infections of cholera vibrios is being studied. Techniques for the processing of whole latter stage embryos have been perfected. Materials from thirty-five series of experimental chicks have been collected and are in various stages of processing or study. Study of the twenty-four hour series has been completed and preliminary study of older infections are in progress. Correlation of the development of the metanephros and shift in function from the mesanephros with susceptibility and route of entry are currently indicated. (Author)

AD-257 790 Div. 16
(16 June 61) OTS price $1.10

Naval Medical Research Inst., Bethesda, Md.
GROWTH OF THE EATON AGENT OF PRIMARY ATYPICAL PNEUMONIA IN CHICK ENTODERMAL TISSUE CULTURE,
by Francis B. Gordon, Alice L. Quan and others. Research rept., 4 Nov 60, vol. 18, pp. 529-532. (Rept. no. 1)
(Proj. MR 005.09-1200.03; In cooperation with National Institutes of Health, Bethesda, Md.)
Unclassified report

DESCRIPTORS: Cells (Biology), Culture media, *Viruses, Virus pneumonia, Growth, Culture, Embryos.

The Eaton agent of primary atypical pneumonia was carried through two series of 10 and 6 passages respectively, in chick entodermal cell cultures, indicating growth of the agent in this cell system. Cytopathic effects were not seen and fluorescent antibody staining of the infected cells by the indirect method was negative. The agent was demonstrated in fluids from the infected cultures by subinoculation to chick embryos and fluorescent antibody staining of lung sections. (Author)

AD-257 791 Div. 16
(16 June 61) OTS price $1.60

Naval Medical Research Inst., Bethesda, Md.
DIVERSITY OF TRANSPLANTATION ANTIGENS IN THE

MOUSE,
by J. H. Berrian and R. L. Jacobs. Research rept. 2 July 60, vol. 18, pp. 213-222, incl. tables, 16 refs. (Rept. no. 4)
(Proj. MR 005.02-0001.03)

Unclassified report

DESCRIPTORS: *Antigens, Transplantation, Genetics, Mice, *Immunization, Spleen, Cells (Biology), Biological specificity.

When mice of one inbred strain are immunized by primary exposure to transplantation antigens from another strain, and subsequently challenged with homografts from a second donor strain, such grafts are frequently rejected prematurely, depending on the genetic relationships of the strains. The result can be taken as evidence that the primary and secondary donor strains share in common histocompatibility genes, hence the corresponding antigens, that the recipient lacks. All of the permutations (36) of primary donors, secondary donors and recipients possible with four strains of mice were tested for shared or related antigens. In this way it was possible to identify several antigenic factors and determine their distribution among the strains when spleen cell suspensions were used for primary immunization. When antigenic cell-free extracts were used for immunization fewer factors were in evidence. It was concluded that transplantation antigens are quite probably a diverse group of substances having distinct physical and chemical properties as well as antigenic specificities. The methodology of transplantation typing is discussed, and the findings are related to the diversity of hemagglutination factors controlled by the H-2 locus. (Author)

AD-257 792 Div. 16
(16 June 61) OTS price $1.10

Naval Medical Research Inst., Bethesda, Md.
EFFECT OF PHOSPHORYLATED HESPERIDIN AND HYALURONIDASE ON THE RATE OF ERYTHROCYTE REMOVAL FROM THE PERITONEAL CAVITY OF RATS,
by Emil Steinberger and W. J. Dixon. Research rept., 30 Sep 60, vol. 18, pp. 423-430, incl. illus. table, 16 refs. (Rept. no. 4)
(Proj. MR 005.03-0001.03)

Unclassified report

DESCRIPTORS: Vitamin P, Hyaluronidase, *Erythrocytes, *Sodium compounds, *Chlorides, Absorption, Phosphorylation, *Abdomen.

Previously reported studies reveal that phosphorylated hesperidin interferes with absorption of 0.9% NaCl solution from the peritoneal cavity of rats, while hyaluronidase facilitzvates this process. In the present study the effect of phosphorylated hesperidin and hyaluronidase on absorption of erythrocytes from the peritoneal cavity was investigated. The absorption rate of erythrocytes from the peritoneal cavity of untreated rats was found to be similar to that reported in the literature, 80% of the red blood cells being removed within 8 hr after administration of the red blood cell suspension. Treatment with phosphorylated hesperidin significantly interfered with the absorption, only 12% of the originally administered erythrocytes being absorbed within the first 8 hr. Hyaluronidase increased the absorption slightly; however this increase was statistically significant. Evidence was presented suggesting that phosphorylated hesperidin exerts its effect by decreasing the permeability of membranes separating the peritoneal cavity from the diaphragmatic lymphatics. (Author)

AD-257 794 Div. 16
(16 June 61) OTS price $1.60

Naval Medical Research Inst., Bethesda, Md.
COPOLYMERS OF ADENYLIC ACID WITH INOSINIC AND CYTIDYLIC ACID,
by Robert Steiner. Research rept., 4 Nov 60, vol. 18, pp. 601-614, incl. illus. tables, 19 refs. (Rept. no. 14)
(Proj. MR 005.06-0001.01)

Unclassified report

DESCRIPTORS: Adenine derivatives, Copolymerization, *Nucleotides, *Adenosine phosphates, Metabolism, Biochemistry, Biosynthesis.

The progressive introduction of inosinic residues into the poly A chain results in: (a) The disappearance of the characteristic structural transition of poly A at acid pH's. (b) A fall in helical content, as measured by ultraviolet hypochromism and optical rotation. (c) A lowering of the melting point of the complex with poly U. (Author)

AD-257 922 Div. 16, 12
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
PRESENCE OF EXHALED CARBON MONOXIDE IN CONFINED CHAMBERS.
24 May 61, 2p. (AID rept. 61-82, Trans. from Exhaled Air as a Source of Carbon Monoxide Contamination of the Atmosphere in Confined Chambers; Voyenno-Meditsinskiy Zhurnal 2:37-39, Feb 61)

Unclassified report

DESCRIPTORS: *Carbon compounds, *Monoxides, *Air, Contamination, Purification, Peroxides, *Respiration, Military medicine, Toxicity, Spaceship cabins, Space capsules, Gases, USSR, Controlled atmospheres, Closed-cycle ecological systems, Biological environment, Physiology.

A study on the contamination of air by exhaled CO oxide in confined rooms is reported. Smokers and nonsmokers were confined in groups of 3 in a testing chamber with a volume of 24 cu m of air for several days. The air-purification system in the chamber was the peroxide type and could only reduce the concentration of CO. Results of the test showed that the nonsmokers exhaled CO at an average rate of 0.016 mg/1 and the smokers, at 0.038 mg/1. After 9 to 10 days the air of the testing chamber with 3 persons contained 0.023-0.027 mg/1 of CO. The toxic effect of CO consists (1) in the exchange of the oxyhemoglobin in the blood for carboxyhemoglobin and (2) in the suppression of the redox ferments of living tissues. (Author)

AD-257 996 Div. 16
(19 June 61) OTS price $1.10

Georgetown U., Washington, D. C.
THE USE OF PSYCHIATRIC DIAGNOSTIC CATEGORIES AS A FUNCTION OF A SPECIALIZED CULTURE IN A PSYCHIATRIC UNIT,
by John H. Rohrer. June 61, 4p.
(Contract Nonr-153007)

Unclassified report

DESCRIPTORS: *Naval personnel, *Mental diseases, Diagnosis, Personality, Learning, Psychiatry.

Data are presented on the type of specific diagnostic labels falling under the general heading of character and personality disorders, gathered for one year at each of the then existing boot training stations of the Navy, i.e., Great Lakes, Bainbridge, and San Diego. Wide variance was noted in the frequency of use of these diagnostic labels at each of the training stations. It was concluded: (1) that the wide variability in the use of the categories would not justify any attempt to relate case history summaries to the diagnostic label in the hope of isolating differential patterns as they apply to the diagnostic label; and (2) the hypothesis was advanced that there is developed in each of the psychiatric evaluation centers, a specialized culture which favors the use of one diagnostic label over another. (Author)

AD-258 035 Div. 16
(20 June 61) OTS price $1.60

Ramos Mejia Hospital (Argentina).
ENZYME HISTOCHEMISTRY IN WOUND HEALING,
by Romulo Luis Cabrini. Final technical rept. 1 May 60-1 May 61. 27 May 61, 11p. incl. illus. 20 refs.
(Grant no. DA-MEDDH-60-4)
Unclassified report

DESCRIPTORS: *Wounds, Healing, Dehydrogenases, Phosphatases, *Tissues (Biology), *Enzymes, Biochemistry.

Wounds performed in skin, Palatal gingiva and tongue of 88 Wistar rats were studied histochemically after the following intervals: three days, one, two and three weeks. Epithelial proliferation is associated with an increase in beta-glucuronidase and a reduction in acid phosphatase and succinic dehydrogenase. Acid phosphatase tends to reappear when keratinization starts. At no time does alkaline phosphatase appear in the epithelium. Connective tissue healing is associated with very high quantities of alkaline phosphatase. The other enzymes appear in lesser amounts. Foreign body granulomas show large quantities of acid phosphatase, beta-glucuronidase and succinic dehydrogenase. (Author)

AD-258 100 Div. 16
(20 June 61) OTS price $1.10

Naval Medical Research Unit No. 3, Cairo, Egypt.
IMPROVED ELECTROPHORETIC RESOLUTION OF ALKALI-RESISTANT HEMOGLOBINS IN STARCH-GELS USING COLLODIAL ELECTROLYTES,
by Kirk C. Hoerman. June 60. 6p. incl. illus.
(Research rept. no. MR005.06-0051.2.02)
Unclassified report

DESCRIPTORS: *Electrophoresis, *Hemoglobin, Tests, Blood chemistry, Electrolytes (Physiology), Blood pigments, Biological stains, Gels, Egypt.

Trimethyloctadecyl ammonium chloride, a cationic active collodial electrolyte, when added to starch-gels before electrophoresis caused a uniform alteration in the migration of alkali-resistant hemoglobin of the new-born and of patients with thalassemia major. Other hemoglobins were not similarly affected. Electrophoretic heterogeneity of the two alkali-resistant pigments was suggested. New components of Hgb F were demonstrated. (Author)

AD-258 101 Div. 16
(20 June 61) OTS price $5.60

Naval Medical Research Unit No. 3, Cairo, Egypt.
TUMOURS OF THE LYMPHO-HAEMOPOIETIC SYSTEM,
by A. Loutfy Aboul Nasr and A. Youssef Awny. Special rept. for Apr-May 1960. 42p. incl. illus.
Unclassified report

DESCRIPTORS: *Tumors, Lymph, Hemopoiesis, Pathology, Egypt, Medical research.

AD-258 140 Div. 16, 20
(19 June 61) OTS price $2.60

Naval Radiological Defense Lab., San Francisco, Calif.
LIMITED EFFECTIVENESS OF ANOXIC ANOXIA IN PROTECTING AGAINST RESIDUAL RADIATION INJURY IN MAMMALS,
by J. S. Krebs and R. W. Brauer. 15 May 61, 20p. incl. illus. tables, 12 refs. (NRDL-TR-509)
Unclassified report

DESCRIPTORS: *Anoxia, Mammals, *Inhibition, Effectiveness, Radiation injuries, Radiobiology, Radiation effects.

The protective effect of anoxic anoxia against residual biological effects of irradiation was measured and compared with the protective effect against acute injury. It was found that a degree of hypoxia sufficient to reduce the effective radiation dose for acute injury by more than half, failed to protect significantly against residual injury. The protective effect of the hypoxia against chronic or repeated radiation injury was intermediate between that for acute and for residual injury. (Author)

AD-258 148 Div. 16
(21 June 61) OTS price $1.60

World Life Research Institute, Colton, Calif.
CONDUCT AN INVESTIGATION OF CIGUATERA POISON,
by Donald W. Hessel. Final progress rept. 1 Apr-31 May 61. 9 June 61, 6p.
(Contract DA 18-108-405-cml-800)
Unclassified report

DESCRIPTORS: *Fishes, *Algae, *Poisons, Purification, Fractionation, Toxicity, Muscles, Chromatographic analysis.

Research on ciguatera toxin has resulted in the development of an efficient method for extracting the toxin from the musculature of fish. Procedures for the partial purification of the crude extract have also been devised. These procedures utilize precipitation of nontoxic material from methanol solution and adsorption of ciguatera toxin on silicic acid. More precise fractionation of ciguatera toxin is accomplished on a silicic acid column developed in stepwise fashion by ether containing small percentages of methanol. As a method for fractionation and as the basis for a test for ciguatera toxin, paper chromatography was examined. Fourteen different solvent systems were utilized, but none proved satisfactory. In almost every case toxicity was found in the region of the solvent front. In miscellaneous experiments it was found that ciguatera toxin, when stored at sub-freezing temperatures either under air or nitrogen, may undergo alteration with an increase in toxicity. In examining the alga Lyngbya majascula for ciguatera poison it was determined that, if the toxin is present in this marine plant, the concentration is very low. (Author)

Division 16 - MEDICAL SCIENCES

AD-258 199 Div. 16
(23 June 61) OTS price $1.10

Tulane U. School of Medicine, New Orleans, La.
STUDIES ON LYMPH AND LYMPHATICS,
by H. S. Mayerson and S. J. LeBrie. Progress rept. 1 June 60-31 May 61. 31 May 61, 7p. illus.
(Contract DA 49-192-md-2012)

Unclassified report

DESCRIPTORS: *Lymph, *Biochemical tests, Blood plasma, Circulatory system, Body fluids, Blood pressure, Blood chemistry, Blood vessels, Proteins, Urea, Sodium compounds, Plasma proteins, Diuretics.

Renal capsular lymph is being collected from anesthetized dogs and characterized under a variety of experimental conditions. The rate of flow from one lymphatic varies from 0.001 to 0.05 ml min with an average of approximately 0.015 ml/min. High venous pressures result in a marked increase in flow, an increase in lymph protein concentration and in the toal amount of sodium returned to the blood stream. Likewise, in nephrosis produced by uranium nitrate, there is an increased lymph flow as there is when diuretics are given. The infusion of test substances into a leg lymphatic of anesthetized dogs and the monitoring of thoracic duct lymph and plasma is being investigated. The distribution of cottonmouth snake venom injected intramuscularly or subcutaneously into the leg of an anesthetized dog is being studied. Preliminary results indicate that some of the venom gets into the blood stream directly without being carried via the lymphatic system. (Author)

AD-258 213 Div. 16
(20 June 61) OTS price $1.60

Washington U., Seattle.
THE INFLUENCE OF pH ON SEROTONIN METABOLISM BY RAT TISSUE HOMOGENATES,
by Akira Horita. Semiannual rept. no. 11, pt. 2, 1 Dec 60-30 May 61. 1 June 61, 8p. tables, 12 refs.
(Contract DA 18-108-cml-6364, Proj. 4-08-02-018-01)

Unclassified report

DESCRIPTORS: *Serotonin, *Metabolism, Hydrogen ion concentration, Tissues (Biology), Indoles, *Oxidases, Amines, Cytochrome oxidase, Enzymes.

Serotonin metabolism by rat tissue homogenates proceed by two pathways. At pH 7.4 monoamine oxidase predominates, but at higher pH's of 8.8 or over a cytochrome oxidase-like enzyme becomes active. (Author)

AD-258 341 Div. 16
(23 June 61) OTS price $1.60

Massachusetts General Hospital, Boston.
STUDY OF SPREADING OF SOLUTIONS ON CUTANEOUS SURFACES AND PENETRATION INTO SKIN,
by Irvin H. Blank and Edith Gould. Comprehensive rept. 12 June 61, 20p. incl. tables.
(Contract DA 18-108-405-cml-672)

Unclassified report

DESCRIPTORS: *Skin, Body surface, Solutions, *Chemical reactions, Acetates, *Methyl radicals, Physiology, Penetration, Pyridines, Additives, *Ions, Inhibition, *Electrostatics, Electical properties, Proteins.

Four mechanisms which may be active in preventing the penetration of ionic surfactants through excised human skin are: (1) physical and chemical structures and reactions which make difficult the establishment of a continuous aqueous pathway through the skin, (2) steric hindrance, (3) electrostatic repulsion, and (4) combination of surfactants with proteins in the stratum corneum. (Author)

17. METALLURGY

AD-257 641 Div. 17, 1, 12, 26
(14 June 61) OTS price $7.60

Battelle Memorial Inst., Columbus, Ohio.
TANTALUM EXTRUSION PROGRAM. STATE-OF-THE-ART SURVEY.
Interim technical rept. no. 1, 2 Dec 60-2 Mar 61. 2 Mar 61, 1v. illus. tables, 56 refs.
(Subcontract to Wah Chang Corp., Albany, Oreg., Contract AF 33(600)42396)
Unclassified report

DESCRIPTORS: *Tantalum, *Tantalum alloys, *Extrusion, Tungsten alloys, Processing, Powder metallurgy, Physical properties, Mechanical properties, Tensile properties, Melting, Electric arcs, Electron beams, Heat resistant alloys, Sintered alloys, Refractory materials, Airframes.

A state-of-the-art survey of the extrusion technology and Ta alloys was completed. A survey of physical and mechanical property data and present day fabrication know-how for ingot production and extrusion practice is presented. There are a limited number (11) of Ta alloys for which data exists. The alloy chosen for this program is the Ta-10% W alloy. Very little data is available on extruding Ta alloys. The state-of-the-art survey will be a guide in determining the necessary melting practice and initial breakdown of the Ta-10% W ingots. It was recommended that electron-beam melting be used in initial melting of the alloy and that consumable-electrode arc-melting be considered for finish melting of the alloy ingots for extrusion, and that simple extrusions be employed in the Phase II evaluation to assess the merits of preworked, recrystallized billets for the extrusion of a Tee section. (Author)

AD-257 654 Div. 17
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NON-FERROUS METALS (SELECTED ARTICLES).
15 Feb 61, 12p. incl. tables, 23 refs. (Trans. no. MCL-139 from Tsvetnye Metally no. 2 pp. 58-64, 1959)
Unclassified report

DESCRIPTORS: USSR, Metals, Rare earths, *Rare earth elements, Rare earth compounds, Borides, Oxides, Sulfides, Silicides, Thermionic emission, Cathodes (Electron tubes), *Niobium alloys, *Tantalum alloys, Processing, Sintering, Sintered alloys, Porosity, Tantalum compounds, Niobium compounds, Carbides, Reduction.

Contents:
Certain important fields of utilizing compounds of rare earth elements, by G. V. Samsonov
Obtainment of Nb-Ta alloys by the carburizing (carbide) methods, by O. P. Kolchin and N. P. Chuveleva

AD-257 664 Div. 17
(14 June 61) OTS price $10.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONFERENCE ON EXPERIMENTAL TECHNIQUE AND METHODS IN HIGH TEMPERATURE INVESTIGATIONS, 1956.
3 Nov 60, 129p. incl. illus. tables, 20 refs.
(Trans. no. MCL-461 from Soveshchaniye Po Eksperimental'noy Tekhnike I Metodam Vysokotemperaturnykh Issledovanly, 1956:pp. 104-107; 147-156; 224-236; 470-477; 619-635, 1959)
Unclassified report

DESCRIPTORS: USSR, *High temperature research, Conferences, *Refractory materials, Metals, Vaporization, *Electron beams, *Steel, Hydrogen, Diffusion, Phase studies, Design, Alloys, *Chromium alloys, Niobium alloys, Test methods, *Molybdenum, Melting, Vacuum furnaces, Electric arcs, *Thermocouples, Thermoelectricity, Calibration.

Contents:
Techniques in vaporization of refractory and chemically active metals in a vacuum by means of a focused electron beam, by M. I. Vinogradov and R. Ye. Rybchinskiy
Rate of diffusion of hydrogen in steels at high temperatures, by R. A. Ryabov and P. V. Gel'd
On the phase diagram of the Cr-Nb system, by V. N. Yeremenko, G. V. Zudilova and L. A. Gayevskaya
Arc fusing of Mo in a vacuum, by A. S. Stroyev, Ye. S. Ovsepyan and A. M. Ivanov
Thermocouple for short-duration temperature measurements reaching 2300 C, by N. I. Svede-Shvets and M. V. Pridantsev

AD-257 667 Div. 17, 26
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE ROLLING OF STAINLESS STEEL Kh17N2 INTO AN ALL-PURPOSE STRIP (Prokatka Nerzhaveyushchey Stali X17H2 Na Universal'nuyu Polosu)
by Ye. I. Astrov. 31 Oct 60, 14p. incl. illus. table (Trans. no. MCL-471 from Obrabotka Metallov Davleniyem 5:62-72, 1959)
Unclassified report

DESCRIPTORS: USSR, *Stainless steel, *Sheets, Rolling mills, Processing, Mechanical properties, Plasticity, Crystal structure, Phase transitions, Test methods, Microstructure, Heat treatment, Steel.

An experiment is reported to determine the optimum procedure for heating and rolling ingots of Kh17N2 steel on a universal mill. The chemical compositions of specimens from 10 experimental melts are presented as well as curves and microphotographs showing the effect of heating temperatures on the mechanical properties and microstructure. The information obtained from the test specimens was made the basis for the heating and rolling of the ingots into strip.

AD-257 671 Div. 17
(14 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CERTAIN PROPERTIES OF BORIDE ALLOYS OF REFRACTORY TRANSITION METALS (Nekotoryye Svoystva Splavov Boridov Tugoplavkikh Perekhodnykh Metallov)
by G. A. Meyerson, G. V. Samsonov and others.
1 Nov 60, 26p. incl. illus. tables, 20 refs.
(Trans. no. MCL-476 from Konferentsiya Po Khimii Bora I Yego Soyedineniі:pp. 58-73, 1955)
Unclassified report

DESCRIPTORS: Alloys, USSR, Refractory materials, *Borides, *Boron alloys, *Phase studies, Crystal structure, Hardness, Corrosion

resistant alloys, *Transition elements, Titanium compounds, Chromium compounds, Tungsten compounds, Zirconium compounds, Carbon compounds, Scale, Heat resistant alloys, Thermal expansion, Preparation, X-ray diffraction analysis, Metallurgical analysis, Electrical properties, Oxidation, Mechanical properties.

TiB2 - CrB2, TiB2 - W2B5, and ZrB2 - C6B2 systems were studied. After taking into account the properties of the initial borides and the possible technical use of their alloys, the research was conducted along the following basic lines: (1) the study of the phase composition and structures of the products of the diffusion reaction of the initial borides; (2) the study of the microhardness of the phases; and (3) the study of the corrosion resistance and the structure of scales of various compositions. (Author)

AD-257 672 Div. 17, 25
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
FORMATION AND MOTION OF DISLOCATIONS IN NICKEL AND IN Ni-Cr ALLOY (Vozniknoveniye I Dvizheniye Dislokatsiy V Nikele I V Splave Ni-Cr)
by O. I. Mgebryan. 1 Nov 60, 10p. incl. illus. (Trans. no. MCL-477 from Nauchnyye Doklady Vysshey Shkoly, Metallurgiya 2:202-206, 1959)
Unclassified report

DESCRIPTORS: USSR, Nickel, Nickel alloys, Chromium alloys, Crystal structure, *Lattices, *Deformation, Shear stresses, Hardening, Heat treatment, Plasticity, Plastic flow, Electrical properties, Electrical conductance, Density, Hardness, Temperature.

The results of experimental research into the process of formation and the motion of dislocations in Ni-Cr alloy are presented. The research was conducted by a method which permits direct study of the motion of dislocations by utilizing the effects caused by them. This method is based upon the assumption that during the elimination and formation of each dislocation, the lattice undergoes a shear strain equal in magnitude to the Burgers vector, and with a change in dislocation densities it is equal to the magnitude of the total of the Burgers vectors of the eliminated or formed dislocations. The secondary plastic effect during the hardening was also considered for Ni (mark Ni000) and Ni-Cr alloy with the chemical composition 85.35% Ni, 14.43% Cr, 0.020% Si, 0.020% C, and Mn-traces. Samples of a corresponding form prepared from these metals were first annealed in a vacuum to relieve residual stresses. (Author)

AD-257 673 Div. 17, 25, 26
(14 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE PROBLEM OF THE NATURE OF CRYSTALLINE CRACKS DURING THE WELDING OF AUSTENITIC STEELS AND ALLOYS (K Voprosu O Prirode Kristallizatsionnykh Treshchin Pri Svarke Austenitnykh Staley I Splavov),
by B. I. Medovar. 1 Nov 60. 21p. incl. illus. 20 refs. (Trans. no. MCL-478 from Avtomaticheskaya Svarka 8:57-66, 1959)
Unclassified report

DESCRIPTORS: Microstructure, Welding rods, Deformation, Lattices, Crystal structure, Grains (Metallurgy), Alloys, Additives, *Welded joints, Welds, *Welding, Phase transitions, *Fracture (Mechanics), USSR, *Steel, Austenite, Crystallization.

The most effective means of preventing cracks in austenitic welded seams is to create conditions for the appearance of the second phase in the process of initial crystallization of the puddle. A positive effect is achieved regardless of the fact that the second phase is primary delta-ferrite, primary carbides of a ledeburite type, or another phase of eutectic origin. To ensure high resistance in an austenitic seam against the formation of hot cracks without resorting to the creation of a second phase, a way must be found for the maximum purification of the metal of the seam from additives which may be capable of causing the formation of a low-melting intercrystalline layer. A very strict limitation of the amount of such additives (as P, Si, S, As, B, and Sn) can sharply increase the resistance of austenitic welded seams against the formation of hot cracks. Moreover, an effective means of reducing the hot-shortness of single-phase welded seams is their supplementary alloying with Mn, Mo, and W. (Author)

AD-257 674 Div. 17
(14 June 61) OTS price $6.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE EFFECT OF SEPARATE ALLOYING ELEMENTS ON THE HEAT RESISTANCE OF METALS (Vliyaniye Otdel'nykh Legiruyushchikh Elementov Na Zharoprochnost')
by P. B. Mikhailov-Mikheyev. 2 Nov 60, 69p. incl. illus. tables, 51 refs. (Trans no. MCL-481 from Metall Gazovykn Turbin:pp. 135-176, 1958)
Unclassified report

DESCRIPTORS: USSR, *Heat resistant alloys, Cobalt alloys, Iron alloys, Nickel alloys, Additives, Phase studies, Mechanical properties, Chromium alloys, Hardening, Creep, Oxidation, Steel, *Alloys, Austenite, Crystal structure, Metallurgy, Dispersion hardening, Metals, Preparation.

AD-257 680 Div. 17, 25
(14 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
RELATIONSHIP BETWEEN THE SERVICE LIFE UNDER LOAD AND THE STRESS APPLIED FOR FERROUS CERAMET SAMPLES IN ALPHA- AND GAMMA-PHASE (Zavisimost' Dolgovechnosti Pod Nagruzkoy ot Prilozhennogo Napryazheniya Dlya Metallokeramicheskikh Obraztsov Zheleza V Al'fa-i Gamma-Fazakh)
by B. Ya. Pines and A. F. Sirenko. 12 Jan 61, 6p. (Trans. no. MCL-616 from Doklady Akademii Nauk SSSR 129:310-313, 1959).
Unclassified report

DESCRIPTORS: USSR, Life expectancy, Stresses, Determination, Deterioration, Temperature, *Powder metals, Solid state physics, Powder alloys, Fracture (Mechanics), Porosity, Sintered iron, Mechanical properties, Load distribution.

AD-257 694 Div. 17
(21 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
HEAT RESISTANCE OF METALS UNDER VACUUM,
by E. N. Marmer. 13 Feb 61, 10p. (Trans. no. MCL-723 from Materialy Vakuumnykh Elektropechey pp. 9-17, 1959)

Unclassified report

DESCRIPTORS: USSR, *Heat resistant alloys, Iron alloys, Chromium alloys, Aluminum alloys, Oxidation, Tests, *Vacuum furnaces, Temperature, High temperature research, Pressure, Nickel alloys.

The results of tests on heat-resistant alloy specimens at 1200 and 1300 C and at a pressure of 0.04 mm Hg show that alloys behave in different ways under vacuum. The following alloys were tested for a period of 110 hr: EI-626, EI-595, EYa-3S, EI-417, EYa-1, Kh20N77T3 and Kh20N80. The following conclusions were made: (1) when heat-resistant alloys are used in vacuum furnaces the possibility of evaporation must be taken into account; (2) for heaters operating at temperatures up to 200 C in any vacuum a double nichrome is recommended; and (3) for heaters operating at a temperature of 1300 C and at pressures of the order 0.01 mm Hg or more, the alloy EI-626 is recommended. At lower pressures and 1300 C, the alloy EI-626 cannot be used because of intensive evaporation. (Author)

AD-257 695 Div. 17, 25
(14 June 61) OTS price $5.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
TERNARY METAL COMPOUNDS,
by V. K. Vul'f. 13 Feb 61, 50p. incl. tables, 174 refs. (Trans. no. MCL-724 from Uspekhi Khimii 29:774-785, 1960).

Unclassified report

DESCRIPTORS: USSR, *Phase studies, *Metallic compounds, Crystal structure, Lattices, Microstructure, Physical properties, Crystallization, Borides, Carbides, Silicides, Nitrides, Electrical properties, Hardness, Mechanical properties, Corrosion, Heat resistant alloys, *Intermetallic compounds, Solid state physics.

Contents:
General features of ternary metal compounds
Ternary Kurnakov phases
Valent ternary metal compounds
Electronic ternary metal compounds
Ternary Laves phases
Ternary Ni-arsenide phases
Ternary interstitial phases
Properties and practical application of ternary metal compounds

AD-257 700 Div. 17, 20
(14 June 61) OTS price $11.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STUDY OF THE STRUCTURE OF METALS BY THE METHOD OF RADIOACTIVE ISOTOPES (SELECTED CHAPTERS) (Issledovaniye Stroyeniya Metallov Metodom Radioaktivnykh Izotopov),
by S. Z. Bokshteyn, S. T. Kishkin, and L. M. Moroz. 24 Feb 61, 141p. incl. tables (Trans. no. MCL-736 from Gosudarstvennoye Izdatel'stvo Oboronnoy Promyshlennosti, Moscow: pp. 95-193, 1959)

Unclassified report

DESCRIPTORS: USSR, *Alloys, *Tracer studies, Isotopes, *Radioactive isotopes, Gamma rays, Beta particles, Microstructure, Metals, Diffusion, Autoradiography, Grains (Metallurgy).

For qualitative and quantitative investigations of the dispersion of elements in alloys and the diffusion of the components in the volume and along the grain boundaries a method was developed which took into consideration the radioactive radiation and specific application of radioisotopes. The accepted method of investigation included: qualitative autoradiography, quantitative autoradiography and the study of movement along the grain boundaries. (Author)

AD-257 716 Div. 17
(15 June 61) OTS price $5.60

Aeroprojects, Inc., West Chester, Pa.
AEROSOL PREPARATION OF COMPOSITE METAL POWDERS FOR DISPERSION STRENGTHENING,
by C. D. McKinney and W. B. Tarpley. Final rept. Mar 61, 52p. incl. illus. tables, 63 refs. (Research Rept. no. RR-61-30)
(Contract NOa(s) 59-6247-c)

Unclassified report

DESCRIPTORS: *Powder metals, Metal coatings, Refractory coatings, Aerosols, Processing, *Dispersion hardening, *Heat resistant alloys, Metallic compounds, Oxides, Coatings, Preparation, Production, Atomization, Aerosol generators, Laboratory equipment, Theory, Refractory materials.

The feasibility of utilizing aerosolization apparatus for preparing composite metal powders of value in the preparation of high-temperature dispersion-strengthened metals was demonstrated in the Ni-alumina, Ni-chromic oxide and Ta-alumina systems. The aerosolization apparatus produces, from bulk powders, individually dispersed particulate clouds which at the instant of separation are individually coated with the composite-forming shell material. Refractory coatings have been dispersed on micron-sized preformed metal particles in order to provide materials analogous to the starting powders of the SAP process. Preformed submicron refractory particles acting as deposition nuclei have also been coated with metal shells by gas-phase chemical reaction of a volatile metal compound. After extrusion, chromic oxide particles dispersed in Ni had a mean free path of 0.5 microns. Ta with dispersed submicron alumina showed a mean free path of 1 micron. Judging by electron microscopic criteria, these metals should have superior high-temperature properites in fabricated shapes to the limit of stability of the dispersed phase and possibly to 0.9 of the homologous temperature. (Author)

AD-257 727 Div. 17
(15 June 61) OTS price $1.10

Armour Research Foundation, Chicago, Ill.
AN INVESTIGATION OF HEAT TREATMENT AND WELDING CHARACTERISTICS OF B 120 VCA TITANIUM ALLOY SHEET. PART II,
by John F. Rudy and Frank A. Crossley. Quarterly rept. no. 1, 16 Dec 60-15 Mar 61, 12 Apr 61, 3p. (Rept. no. ARF 2211-1)
(Contract NOw 61-0351-c)

Unclassified report

DESCRIPTORS: *Titanium alloys, *Sheets, Heat treatment, Welding, Welds, Aging, Elasticity, Phase transitions, Measurement, Determination, Tensile properties, Mechanical properties.

Division 17 - METALLURGY

Studies were continued to obtain a better understanding of the physical metallurgy of the aging reaction of B 120 VCA Ti alloy sheet to establish an optimum heat treatment. The loss of ductility of the weld metal when aged to relatively low strength levels is another area of concern as well as the effects of filler metal composition, the cold roll and duplex age sequence, grain refining treatments (cold roll and solution treat at about 1200 for 2 to 10 hr), and the transformation behavior of the base and weld metals. Welds in the as-received base material prior to aging are being cold rolled to reductions of 10 and 25%. Elastic modulus determinations will be made on base metals and weld metals subjected to various heat treatments.

AD-257 735 Div. 17, 25
(15 June 61) OTS price $10.10

Columbia U., New York.
DEFORMATION AND FRACTURE OF CADMIUM AND CADMIUM-MAGNESIUM ALLOYS,
by Norman S. Stoloff. Apr 61, 128p. incl. illus. tables, 57 refs.
(Contract AF 49(638)408)
(AFOSR-593) Unclassified report

DESCRIPTORS: *Cadmium, *Cadmium alloys, Magnesium alloys, *Deformation, Transition temperature, *Fracture (Mechanics), Stresses, Single crystals, Crystals, Crystal structure, Tensile properties, Mechanical properties, Lattices.

An attempt was made to determine the mechanisms of deformation and fracture in polycrystalline Cd, to correlate these mechanisms with pertinent aspects of single crystal behavior, and to determine whether the slip systems and mode of fracture of polycrystalline Cd could be altered by reduction of the axial ratio (1.886) by alloying. Tests on polycrystalline Cd and Cd-Mg alloys indicated that the yield stress, flow stresses for arbitrary small strains, and the average coefficient of work hardening were relatively insensitive to temperature from room temperature to 4.2 K. The tensile strength of Cd was strongly temperature dependent but relatively independent of grain size between room temperature and -175C; below-175C it was dependent on grain size, but not on temperature. Cd had a ductile to quasi-brittle transition at about -155C which did not depend on grain size or purity. The minimum ductility, about 15% reduction in area, was reached near -196 and persisted at -269C.

AD-257 739 Div. 17
(16 June 61) OTS price $3.50

Defense Metals Information Center, Columbus, Ohio.
BINARY AND TERNARY PHASE DIAGRAMS OF COLUMBIUM, MOLYBDENUM, TANTALUM, AND TUNGSTEN,
by J. J. English. 28 Apr 61, lv. incl. illus, 233 refs. (DMIC rept. no. 152)
(Contract AF 33(616)7747)
Unclassified report

DESCRIPTORS: Refractory materials, *Phase studies, Molybdenum, Niobium, Tantalum, Tungsten, *Molybdenum alloys, *Niobium alloys, *Tantaltum alloys, *Tungsten alloys, *Intermetallic compounds, Solubility, *Metals, Alloys, Hydrides, Crystal structure, Eutectics, Lattices, Transition elements, Borides, Carbides, Nitrides, Oxides, Silicides, Metallic compounds.

A compilation is presented of 93 binary and 68 ternary phase diagrams of the 4 refractory metals, Nb, Mo, Ta, and W. Included with each diagram is a discussion which lists information on the solubility and crystal structure of intermediate phases. When several investigations of a particular diagram are in disagreement, the discrepancies are discussed. The phase diagrams are divided into two sections: binary systems and ternary systems. The binary diagrams are arranged into 4 groups, 1 for each of the 4 metals. Within each group the systems are arranged in alphabetical order according to the spelling of the second element in the system. The ternary phase diagrams are also arranged alphabetically in 4 groups. When 2 or more refractory metals occur in a system they are listed first, in alphabetical order. (Author)

AD-257 812 Div. 17, 26
(15 June 61) OTS price $1.60

Republic Steel Corp., Canton, Ohio.
EVALUATION OF THE PRODUCIBILITY OF TWO NEW TITANIUM BASE SHEET ALLOYS, Ti-7Al-12Zr AND Ti-5Al-5Zr-5Sn,
by M. Scott and T. Vretas. Bi-monthly rept. no. 7, 1 Mar-30 Apr 61. 15 May 61, 16p. incl. illus. tables.
(Contract NOa(s) 60-6035-c)
Unclassified report

DESCRIPTORS: *Titanium alloys, *Sheets, Production, Processing, Surface properties, Contamination, Aluminum alloys, Zirconium alloys, Tin alloys, Heat treatment, Pickling, Cleaning, Tensile properties, Aging, Rolling mills, Mechanical properties.

Studies were continued on the effect of surface contamination on annealed test samples exposed at 1000 F for 150 hr (Ti-7Al-12Zr alloy). Total surface removal before and after exposure varied from 0.012 to 0.020 inch. H content had a marked influence on tensile ductility after exposure. Mill processing of the 0.020, 0.040, 0.060, and 0.080-in. ga. sheet Ti-7Al-12Zr alloy was completed. An investigation was conducted on the Ti-5Al-5Zr-5Sn alloy to note the effect on tensile and bend properties of 0.030- and 0.050-in. ga. sheets annealed at 1450 to 1750 F. A limited amount of tensile testing was performed to note the aging effect, if any, on solution treated and aged sheet product; there was no apparent aging response for this alpha type alloy. Chemical check analyses made on random as hot rolled sheets of Ti-5Al-5Zr-5Sn showed that the Al, Zr, and Sn contents were uniform. (Author)

AD-257 836 Div. 17
(16 June 61) OTS price $17.50

Westinghouse Electric Corp., Pittsburgh, Pa.
DEVELOPMENT OF A NICKEL-BASE MATERIAL DISPERSION HARDENED BY ALUMINA FOR 1600 F TO 2000 F SERVICE,
by D. H. Feisel. Final rept. 6 Jan 59-6 Nov 60. 6 Dec 60, 257p. incl. illus. tables, 20 refs.
(Contract NOa(s) 59-6051-c)
Unclassified report

DESCRIPTORS: *Heat resistant alloys, *Nickel alloys, *Dispersion hardening, Aluminum compounds, Oxides, Powder alloys, Powder

metallurgy, Chemical properties, Mechanical properties, Physical properties, Oxidation, Catalysis, Lattices, Preparation, Extrusion, Powder metals, Microstructure, Hardening, Hardness, Electron microscopy, Creep, Phase studies, Density, Stresses.

The chemical, physical, and mechanical properties of a number of Ni-base dispersion-hardened alloys were studied. A technique involving partial oxidation of active Raney Ni catalyst was employed to attain a dispersion of Al2O3 in the matrix. The matrix compositions of the alloys were grouped into four classes: (1) Ni, (2) Ni solid solution, (3) Ni solid solution + Ni3(Al, Fe), (4) Ni3(Al, Fe). Data are presented for techniques of preparation, alloy composition, density, hardness, oxidation resistance, tensile strength, compressive strength, stress-rupture strength, and compressive creep strength. (Author)

AD-257 860 Div. 17
(20 June 61) OTS price $3.00

Advanced Metals Research Corp., Somerville, Mass.
DIFFUSION IN REFRACTORY METALS,
by N. L. Peterson. Rept. for Apr-Sep 60, on Metallic Materials. Mar 61, 164p. incl. illus. tables, 193 refs.
(Contract AF 33(616)7382, Proj. 7351)
(WADD TR 60-793) Unclassified report

DESCRIPTORS: *Refractory materials, *Diffusion, *Metals, *Alloys, Intermetallic compounds, Metallic compounds, Molybdenum, Niobium, Tantalum, Tungsten, Zirconium, Hafnium, Photoelectric effect, Chemical analysis, Platinum, Titanium, Chromium, Vanadium, Carbon, Hydrogen, Nitrogen, Oxygen, Tracer studies, Thermionic emmission, Spectrographic analysis.

Data available in the open literature on diffusion in tungsten, tantalum, molybdenum, niobium, platinum, hafnium, zirconium, vanadium, chromium, and titanium is reviewed and evaluated. Information on ninety-five binary systems and thirteen ternary or higher order systems is reported. For some systems where no diffusion data was available, diffusion coefficients were estimated from existing theories or from data on diffusion controlled processes. (Author)

AD-257 865 Div. 17, 26
(20 June 61) OTS price $3.00

Harvey Aluminum, Inc., Torrance, Calif.
DEVELOPMENT OF OPTIMUM METHODS FOR THE PRIMARY WORKING OF REFRACTORY METALS,
by R. B. Simonson, J. W. Long and others. Rept. for 1 Apr 59-31 May 60, on Metallic Materials. Jan 61, 172p. incl. illus. tables.
(Contract AF 33(616)6377)
(WADD TR 60-418) Unclassified report

DESCRIPTORS: *Refractory materials, Processing, *Extrusion, Molybdenum, Tantalum, Titanium, Tungsten, Molybdenum alloys, Tantalum alloys, Titanium alloys, Tungsten alloys, Forging, Metallurgical laboratories, Pressure, Dies, Coatings, Ceramic coatings, Microstructure, Crystal structure, Hydraulic pressess, Forge presses, Heaters, Rolling mills, Hardness, Temperature.

Efforts were made to accelerate the refractory metal-alloy development program by providing wrought material for subsequent physical testing and evaluation. To implement this work, the Materials Central Metal Working Facility, at Wright-Patterson Air Force Base, Ohio, has been operated, maintained and substantially modified. Facility capability has been demonstrated by the extrusion of Mo, W, Ti, Ta, and alloys thereof, for the Materials Central, DOD agencies, and certain industrial organizations. The Metal Working Facility is described; the development of extrusion techniques, extrusion effort, and the metallurgical evaluation resulting therefrom are reported and discussed. (Author)

AD-257 866 Div. 17, 25
(20 June 61) OTS price $4.60

Illinois U., Urbana.
INELASTIC DESIGN OF LOAD CARRYING MEMBERS. PART II. THE EFFECT OF END CONDITIONS ON THE COLLAPSE LOAD OF COLUMNS,
by G. A. Costello, O. M. Sidebottom, and Eugene Pocs. Rept. for 1 Nov 59-31 Oct 60 on Behavior of Metals. Jan 61, 40p. incl. illus. tables, 14 refs.
(Contract AF 33(616)5658, Proj. 7351)
(WADD TR 60-580, pt. 2) Unclassified report

DESCRIPTORS: *Beams, Design, Theory, Deformation, Deflection, Load distribution, Mathematical analysis, Tests, Creep, Structures, Mechanics, Test methods, Stainless steel, Buckling, Failure (Mechanics).

A theory was presented for constructing the load-deflection relation and for determining the collapse load of a column having any known end condition. A trial and error solution was required which used interaction curves and assumed that the inelastic column assumed the shape of a sine curve. For time independent inelastic deformation, constant depth of yielding interaction curves were used. For time dependent (creep) inelastic deformation arc hyperbolic sine interaction curves were used. The experimental part of the investigation included tests of rectangular section columns made of 17-7PH stainless steel and tested at room temperature and at 972 F. Several slenderness ratios were considered, and the columns had end conditions which were either fixed, equal and opposite end eccentricities, or unequal end eccentricities. Good agreement was found between theory and experiment. (Author)

AD-257 900 Div. 17, 1, 26,
(21 June 61) OTS price $10.50

North American Aviation, Inc., Los Angeles, Calif.
EVALUATION OF NEW TITANIUM SHEET ALLOYS FOR USE IN AIRFRAME CONSTRUCTION. VOLUME I. A DESCRIPTION OF THE BASIC OBJECTIVES OF CONTRACT AF 33(600)33597, THE SELECTION OF PARTS FABRICATED UNDER THIS CONTRACT, THE SELECTION OF THE SHEET ALLOYS EVALUATED, AND THE RESULTS OF A PRELIMINARY EVALUATION OF Ti-16V-2.5Al AND Ti-4Al-3Mo-1V SHEET ALLOYS ARE PRESENTED IN THIS VOLUME.
Final technical engineering rept. vol. 1, 9 Sep 56-10 Apr 60, 30 Dec 60, 137p. incl. illus. tables (Rept. no. NA-57-184-15, vol. 1)
(Contract AF 33(600)33597, Proj. 60-7-561)
(AMC TR 60-7-561, vol. 1) Unclassified report

DESCRIPTORS: *Titanium alloys, *Sheets, *Airframes, Processing, Aluminum alloys, Molybdenum alloys, Vanadium alloys, Mechanical properties, Manufacturing methods, Deformation, Aging, Surface properties, Tests, Stresses, Temperature, Test methods.

A description is presented of the basic objectives, the selection of parts (airframe), the selection of sheet alloys, and the results of a preliminary evaluation of Ti-16V-2Al and Ti-4Al-3Mo-1V alloys. On the basis of mechanical property and forming tests, Ti-4Al-3Mo-1V alloy was selected for full evaluation. Although elevated-temperature testing was not extensive, the maximum useful temperature of Ti-16V-2.5Al alloy appeared to be about 700 F because of temperature-stress instability. The creep strength of Ti-4Al-3Mo-1V at 600 and 800 F was significantly higher than that of Ti-16V-2.5Al alloy. Ti-4Al-3Mo-1V also appeared to have the better formability.

AD-257 901 Div. 17, 1, 26
(21 June 61) OTS price $9.60

North American Aviation, Inc., Los Angeles, Calif.
EVALUATION OF NEW TITANIUM SHEET ALLOYS FOR USE IN AIRFRAME CONSTRUCTION. VOLUME II. THE TARGET SPECIFICATION WHICH WAS USED TO PURCHASE THE COMMERCIAL MATERIAL FOR THIS CONTRACT, OUTLINES OF THE MILL PRODUCTION PROCEDURES, AND THE RESULTS OF RECEIVING INSPECTION TESTS OF THE SHEETS RECEIVED FROM TITANIUM METALS CORP. OF AMERICA, MALLORY-SHARON METALS CORP., AND THE CRUCIBLE STEEL CO. OF AMERICA ARE GIVEN IN THIS VOLUME.
Final technical engineering rept. vol. 2, 9 Sep 56-10 Apr 60, 30 Dec 60, 117p. incl. illus. tables. (Rept. no. NA-57-184-15, vol. 2)
(Contract AF 33(600)33597, Proj. 60-7-561)
(AMC TR 60-7-561, vol. 2) Unclassified report

DESCRIPTORS: *Titanium alloys, *Sheets, Specifications, Rolling mills, Quality control, Aluminum alloys, Molybdenum alloys, Vanadium alloys, Manufacturing methods, Surface properties, Microstructure, Tensile properties, Airframes, Processing, Tests, Test methods.

The target specification which was used to purchase commercial material, the outline of the mill production procedures, and the results of the receiving inspection test of sheets received from 3 sources are given. A total of 764 sheets and plates of the Ti-4Al-3Mo-1V alloy in gages of from 0.020 to 0.313 in. was ordered from the three producers. All the material was purchased in the solution-treated condition to a North American Aviation specification. (Author)

AD-257 902 Div. 17, 1, 26
(21 June 61) OTS price $15.00

North American Aviation, Inc., Los Angeles, Calif.
EVALUATION OF NEW TITANIUM SHEET ALLOYS FOR USE IN AIRFRAME CONSTRUCTION. VOLUME III. THE RESULTS OF TESTS TO DETERMINE THE CONSISTENCY OF Ti-4Al-3-Mo-1V ALLOY PRODUCED AS A COMMERCIAL MATERIAL, TO OBTAIN DESIGN STRENGTHS, TO ESTABLISH FORMING LIMITS, AND TO DETERMINE THE EFFECT OF PROCESSING ON THE MATERIAL PROPERTIES, AND THE RESULTS OF RESISTANCE WELDING TESTS ARE GIVEN IN THIS VOLUME.
Final technical engineering rept. vol. 3, 9 Sep 56-10 Apr 60, 30 Dec 60, 222p. incl. illus. tables. (Rept. no. NA-57-184-15, vol. 3)
(Contract AF 33(600)33597, Proj. 60-7-561)
(AMC TR 60-7-561, vol. 3) Unclassified report

DESCRIPTORS: *Titanium alloys, *Sheets, Airframes, Processing, Tests, Mechanical properties, Heat treatment, Welding, Design, Tensile properties, Surface properties, Aluminum alloys, Molybdenum alloys, Vanadium alloys, Hydroforming, Electric welding, Test methods.

Results are presented of tests to determine the consistency of commercial Ti-4Al-3Mo-1V (3 sources), the design strengths, the forming limits, the effect of processing on the material properties, and the resistance welding characteristics. The suppliers will provide material with a minimum ultimate strength of 180,000 psi and 155,000 psi yield strength after aging at 925 F for 12 hr. Ti-4Al-3Mo-1V alloy is subject to the Bauchinger Effect, and tensile strains developed by forming operations will cause a reduction in the compressive strength. Forming limits for manufacturing operations are based on sheets reworked by the Scotch Brite process to minimize grind marks.

AD-257 903 Div. 17, 1, 26
(21 June 61) OTS price $8.10

North American Aviation, Inc., Los Angeles, Calif.
EVALUATION OF NEW TITANIUM SHEET ALLOYS FOR USE IN AIRFRAME CONSTRUCTION. VOLUME IV. THE RESULTS OF PRELIMINARY INVESTIGATIONS OF PRODUCTION FABRICATION METHODS ARE REPORTED IN THIS VOLUME.
Final technical rept. vol. 4, 9 Sep 56-10 Apr 60, 30 Dec 60, 84p. incl. illus. tables.
(Rept. no. NA-57-184-15, vol. 4)
(Contract AF 33(600)33597, Proj. 60-7-561)
(AMC TR 60-7-561, vol. 4) Unclassified report

DESCRIPTORS: *Titanium alloys, *Sheets, Airframes, Processing, Manufacturing methods, Aluminum alloys, Molybdenum alloys, Vanadium alloys, Heat treatment, Rolling mills, Metal forming brakes, Deformation, Tests, Test methods.

Stretch-wrap tests, springback investigation, and hot-straightening test results were used to modify tooling or processes in the parts fabrication phase. Of the 9 dimpling methods tried on aged Ti-4Al-3Mo-1V alloy, only the Zephyr method using resistance heating of the area to be dimpled was satisfactory. Small conical sections were sucessfully spun in both the annealed and solution-treated condition. Smaller bend radii and less springback were obtained by roll forming than were possible by brake forming. The use of high pressure (10,000 to 35,000 psi) offered no advantages in rubber forming (Guerin or Marform process). Die-quench forming has potential application for simultaneous forming and heat treating parts which can not be formed in the solution-treated condition.

AD-257 904 Div. 17, 1, 26
(21 June 61) OTS price $21.00

North American Aviation, Inc., Los Angeles, Calif.
EVALUATION OF NEW TITANIUM SHEET ALLOYS USED IN AIRFRAME CONSTRUCTION. VOLUME V. THE RESULTS OF THE FABRICATION OF AIRFRAME PARTS ARE REPORTED IN THIS VOLUME, AND RECOMMENDATIONS FOR THE MANUFACTURE OF PARTS ARE GIVEN.
Final technical engineering rept. vol. 5, 9 Sep 56-10 Apr 60, 30 Dec 60, 389p. incl. illus. tables (Rept. no. NA-57-184-15, vol. 5)
(Contract AF 33(600)33597, Proj. 60-7-561)
(AMC TR 60-7-561, vol. 5) Unclassified report

DESCRIPTORS: *Titanium alloys, *Sheets, Airframes, Processing, Manufacturing methods, Surface properties, Tools, Aluminum alloys, Molybdenum alloys, Vanadium alloys, Heat treatment, Hydraulic presses, Deformation, Metal forming brakes, Tests, Rolling mills, Hydroforming, Metal forming presses.

The results of the fabrication of airframe parts from the Ti-4Al-3Mo-1V alloy were reported; efforts were concentrated on 15 parts. The formability of the Ti-4Al-3Mo-1V alloy was significantly affected by the surface condition of the sheet. The sheets in the solution-treated condition were not as flat as sheets of annealed titanium alloys. Parts made from Ti-4Al-3Mo-1V alloy in the solution-treated condition should usually be formed at room temperature. Hot sizing in presses or aging fixtures will usually be required to produce net parts. The tooling for both cold forming and hot sizing operations should be designed to produce dimensionally correct parts. It was possible to establish manufacturing processes and design limitations for the use of the Ti-4Al-3Mo-1V alloy in advanced weapon systems. (Author)

AD-257 926 Div. 17
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
HIGH-PURITY COLUMBIUM.
1 June 61, 2p. (AID rept. 61-86, Trans. from Vacuum Refining of Columbium; Fizika Metallov I Metallovedeniye 11:461-464, Mar 61)
Unclassified report

DESCRIPTORS: USSR, *Niobium, *Preparation, Powder metals, Powder metallurgy, Sintering, Vacuum furnaces, *Purification, Melting, Electric arcs, Controlled atmospheres, Argon, Mechanical properties, Hardness, Production, Chemical impurities, Impurities.

Experiments with inert-gas arc melting were made to produce high-purity solid Nb. The raw Nb powder used was 98.7% pure and contained 0.08% Fe, 0.2% Pb, 0.04% Si, 0.18% C, and H2O, O2, N2, and H2. The Nb powder was dried and compacted into billets under 5 to 6 ton/sq cm pressure. Sintering was done in two stages. In the first stage, the billets were held in vacuum (0.00001 to 0.00002 mm Hg) at 1400 C for 4 to 6 hr until any remaining moisture and H were eliminated. In the second stage, the billets were resistance heated to 2300 to 2350 C and held for 8 hr in a vacuum of 0.00001 mm Hg to eliminate the remaining impurities. The refined billets were then melted in an electric-arc furnace with a Cu water-cooled hearth in an atmosphere of high-purity argon. (Author)

AD-257 950 Div. 17, 25, 26
(19 June 61) OTS price $7.60

Aeon Labs., Gt. Brit.
THE THEORY OF MICROTOME SECTIONING WITH AN INFINITELY SHARP CUTTING EDGE,
by A. Brown and R. Phillips. Final Annual technical rept. no. 2. 1 Mar 60-28 Feb 61. 28 Feb 61, 45p. illus. table.
(Contract DA 91-591-EUC-1404, Proj. 0I-4380-60)
Unclassified report

DESCRIPTORS: *Microtomes, *Cutting tools, Theory, Microscopy, Stresses, Deformation, Elasticity, Plasticity, Shear stresses, *Metals, Plastics, Brittle materials, Single crystals, Electron microscopy, Crystal structure, Surfaces, *Machining, Tests, Design.

A variety of metallurgical and other specimens sectioned on a diamond knife ultra microtome were studied by means of light and electron microscope techniques in an investigation of the mechanisms involved in the machining of metals. It was observed (1) that, when elastic properties were maintained under the highest strains applied during cutting, the sections were not deformed, and (2) that for plastically deforming materials the simple plastic shear may be accompanied by plastic shear on another system in the relief of compressive stresses, causing curvature of the section. A model for this composite stress-relieving mechanism is described. Factors determing the propagation of slip in ductile metals may cause either homogeneous shear with successive slip planes activated or a discrete step slip pattern. Section formation in brittle materials or under conditions with knife edge defects occurs as a series of fractures in the plane of maximum shear stress. Special apparatus was designed to facilitate crystal preorientation for transmission electron microscopy and electron diffraction and replication studies.

AD-257 963 Div. 17
(19 June 61) OTS price $1.10

Armour Research Foundation, Chicago, Ill.
DUCTILE HIGH-TEMPERATURE TUNGSTEN ALLOYS,
by D. Weinstein and F. C. Holtz. Monthly rept. no. 11, 1-31 May 61. 12 June 61, 3p. (Rept. no. ARF 2182-23)
(Contract DA 11-022-505-ORD-3092, Proj. TB4-002)
Unclassified report

DESCRIPTORS: *Tungsten alloys, Heat resistant alloys, Sintered alloys, Powder alloys, Powder metals, *Sintering, *Thorium alloys, Tensile properties, High temperature research, Powder metallurgy, Deformation, Fracture (Mechanics).

Three cylinders of W-20Th, about 1/2 in. diameter by 1 1/8 in. high, were sintered near 2500 C, and a small tensile specimen (about 1/4 in. gage length) was machined from each cylinder. A modification of the sintering furnace allowed testing at temperatures as high as 2500 C; a predetermined stress was applied to the specimen (dead load), and the temperature was increased until fracture occurred. The applied stress and temperature where fracture occurred were as follows: (1) 4550 psi at 1760 C, (2) 3090 psi at 1965 C, and (3) 1750 psi at 2155 C. While these values are not as high as that reported for unalloyed W, they indicate definite promise for the W-Th system as high-temperature, composite material which is ductile at room temperature. The room-temperature rolling characteristics of W-20Th were redetermined. As previously reported, about 80 per cent cold reduction was possible before edge cracking became excessively severe. An attempt at warm rolling (about 400 C) resulted in poor workability. (Author)

AD-257 967 Div. 17, 26
(20 June 61) OTS price $1.60

Ingersoll Kalamazoo Div., Borg-Warner Corp., Mich.
SURFACE DECARBURIZATION PROGRAM,
by L. E. Hershey. Quarterly rept. no. 1, 1 Jan-31 Mar 61. 31 May 61, 12p. incl. illus. table.
(Contract NOrd-15719)
Unclassified report

DESCRIPTORS: *Steel, *Heat treatment, Surface properties, Carbon, Hardening, Controlled atmospheres, Processing, Fatigue (Mechanics), Tensile properties, Test methods, Mechanical properties.

Efforts were initiated to determine the optimum decarburization depth and gradient for 3 steels in 3 thicknesses. The steels are AISI 9262, Super Tricent and MBMC #1, and the thicknesses are 0.050, 0.100 and 0.150 inches. Parent metal and welded specimens are to be evaluated. The method of evaluation will be by edge and center notch specimen tests for the notch toughness parameters and bent beam stress corrosion tests for the stress corrosion properties of the optimum conditions of decarburization evolved. Cases fabricated by power spinning (seamless) and by roll-and-weld techniques are to be fabricated to verify the laboratory results. Trial MBMC #1 steel forgings were spun and processed into specimen blanks, AISI 9262 steel was received, center and edge notch specimen preparation methods were investigated, process charts for center and edge notch specimens were prepared, data sheets for specimen pulling and calculation were prepared, and the laboratory heat treat equipment was setup and tried. (Author)

AD-257 995 Div. 17, 22
(19 June 61) OTS price $3.60

General Technology Corp. Elgin, Ill.
CALCULATIONS ON THE AXISYMMETRIC DISPLACEMENTS AND STRAINS OF A LONG, THICK CYLINDRICAL SHELL UNDER AXISYMMETRIC LOADS,
by R. J. Jezik and N. F. Jordan. Rept. on Research and Development Study on Stress-Strain Characteristics of Shells and High Explosives. May 61, 17p. illus. (Technical rept. no. 1-15)
(Contract DA 11-022-501-ORD-2907, Proj. TA2-8051)
Unclassified report

DESCRIPTORS: Projectiles, Design, *Cylindrical bodies, *Structural shells, Deformation, Stresses, Mathematical analysis, Load distribution, Mechanical properties.

Calculations are presented for axisymmetric displacements and stresses of long, thick cylindrical shell subjected to (1) a concentrated ring load; (2) a uniform pressure acting on the infinite, left-hand portion of the shell; and (3) a uniform pressure confined to a band width on the axis of the shell. The results are given as dimensionless ratios. For each type of loading, dimensionless ratios involving the radial displacement and dimensionless ratios involving the circumferential strain are plotted against distance along the axis. Tables are also presented which contain precise values of strain or deflection at various points. The analyses were compared with the analyses contained in the Watertown Arsenal Report no. 893/172(AD-57994), Thick-Walled Cylinder Handbook, by extrapolating the data to thinner shells. Good agreement was obtained for the case of uniform pressure on the left half of the shell.

AD-258 024 Div. 17, 1, 25
(21 June 61) OTS price $1.00

Columbia U., New York.
REDUCTION OF THE ENDURANCE LIMIT AS A RESULT OF STRESS INTERACTION IN FATIGUE,
by Robert A. Heller. Rept. for 1 Feb-31 July 60 on Metallic Materials. Feb 61, 22p. incl. illus. tables, 14 refs.
(Contract AF 33(616)7042, Proj. 7351)
(WADD TR 60-752) Unclassified report

DESCRIPTORS: Steel, Aluminum alloys, *Fatigue (Mechanics), Mechanical properties, Aircraft, Airframes, Materials, Design, Tests, Test equipment, Stresses, Plasticity, Theory, Equations, Structures, Mathematical analysis, Load distribution.

Results are presented of an investigation of the effects of stress interaction on fatigue life of aircraft structural materials subjected to randomized load spectra. All three materials: 2024 and 7075 aluminum and SAE 4340 steel exhibit fatigue lives shorter than those predicted on the basis of the linear (Miner) damage rule. A quasi-linear rule is proposed with a variable, spectrum dependent, endurance limit producing safe life estimates; the dependence of the endurance limit on the stress spectrum and its resulting design inadequacy is shown. Tests were performed on high speed, programmed, rotating bending fatigue machines of special design. (Author)

AD-258 040 Div. 17
(19 June 61) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
STANDARD DESIGNATIONS OF ALLOYS FOR AIRCRAFT AND MISSILES, TRADE NAMES, AERONAUTICAL AND MILITARY SPECIFICATIONS, AND PRODUCERS OF STAINLESS STEELS, ALLOY STEELS, AND SUPERALLOYS,
comp. by J. J. Vagi and A. F. Haskins. 24 May 61, 78p. incl. tables (DMIC memo. no. 42R; supersedes AD-233 728)
Unclassified report

DESCRIPTORS: *Alloys, Aircraft, Materials, Guided missiles, Specifications, Industry, Military requirements, Steel, *Tool steel, Stainless steel, *Corrosion resistant alloys, *Airframes.

This memorandum is a revision of DMIC Memorandum 42, dated January 25, 1960. An effort has been made to bring the material up to date as of the end of 1960. These tabulations were prepared to assist the Defense Metals Information Center at Battelle Memorial Institute in classifying information on metals and alloys for aircraft and missiles. Four tabulations are included. (Author)

AD-258 041 Div. 17
(19 June 61) OTS price $1.25

Defense Metals Information Center, Columbus, Ohio.
PHYSICAL METALLURGY OF NICKEL-BASE SUPERALLOYS,
by C. H. Lund. 5 May 61, 40p. incl. illus. tables, 37 refs. (DMIC rept. no. 153)
(Contract AF 33(616)7747)
Unclassified report

DESCRIPTORS: Heat resistant alloys, *Nickel alloys, Heat treatment, Hardening, Dispersion hardening, Crystal structure, Deformation, Boron alloys, Zirconium alloys, Lattices, Physical properties, Grains (Metallurgy), Failure (Mechanics), Tensile properties, Microstructure, Mechanical properties, Corrosion, Phase studies, Oxidation, Corrosion resistant alloys.

Nickel-base superalloys are discussed from the standpoint of strengthening mechanisms, heat treatment, and evolutionary history. Solid-solution hardening, precipitation hardening,

strengthening by boron and zirconium additions, and failure are considered in general theoretical terms. Dislocation movement and coherency effects are discussed and related to elevated-temperature strength properties. The more prominent reactions taking place during the heat treatment of nickel-base superalloys are described. The gamma prime and eta precipitates are described. Observations are presented on the behavior of complex carbides of the M23C6 and M6C types, at both inter- and intragranular locations. Microstructural changes that occur during heat treatment are related to contemporary alloys. Chemical compositions and mechanical properties are tabulated for 30 selected British, U. S., and Soviet alloys. (Author)

AD-258 089 Div. 17
(23 June 61) OTS price $1.10

Armour Research Foundation, Chicago, Ill.
DEVELOPMENT OF DUCTILE BERYLLIUM COMPOSITES,
by Frank A. Crossley. Bimonthly rept. no. 2, 18 Mar-17 May 61. 17 May 61, 5p. incl. illus. table (Rept. no. ARF 2212-2)
(Contract NOw 61-0370-c)
Unclassified report

DESCRIPTORS: Beryllium, *Beryllium alloys, *Silver alloys, Aluminum alloys, Bonding, Powder metals, Heat treatment, Mechanical properties, Extrusion, Sintering, Binders, Sintered alloys, *Powder alloys, Processing, Powder metallurgy, Preparation.

Further efforts to produce ductile Be composites consisting of beryllium particles in a ductile matrix are reported. A number of composites were tested in uniaxial compression in order to determine the matrix composition and heat treatment for the best mechanical properties. Silver-base matrices containing 6, 7, and 8% Al were evaluated. The best results were obtained for the Ag-6Al matrix which indicated that Ag-5Al should be evaluated. A 3/4-in.-diam compact (Ag-6Al matrix) was canned in Cu and successfully extruded at 500 C with a reduction ratio of 2.5:1. (Author)

AD-258 094 Div. 17, 22
(20 June 61) OTS price $4.60

Kaiser Aluminum and Chemical Corp., Spokane, Wash.
EFFECT OF CONTROLLED WELD DEFECTS ON THE BALLISTIC PERFORMANCE OF 5083 ALUMINUM ALLOY WELDMENTS,
by M. B. Kasen. (Phase rept. no. 9) 2 June 61, 46p. incl. illus tables (Interim proj. rept. no. MS PR 61-45)
(Contract DA 04-200-507-ORD-333, Proj. nos. 593-32-003 and 593-32-005)
Unclassified report

DESCRIPTORS: *Aluminum alloys, Metal plates, *Welds, Welded joints, Terminal ballistics, *Armored plate, Armor vehicles, Quality control, Standards, Non-destructive testing, Radiography, Ultrasonics, Impact shock, Fracture (Mechanics), Test methods, Physical properties, Mechanical properties.

Specialized welding techniques were used to produce 27 weldments that contained controlled variations in the types and severities of weld defects. The weld defects introduced into the 1-1/4-in. thick double V-groove butt weldments were: (1) gas porosity, (2) lack of root fusion, (3) distributed fine dross particles, and (4) coarse dross films. These defects adversely affected the ballistic performance of the weldments, but not to an alarming degree. It was estimated that the deleterious effect increased in about the following order: (1) no weld defects, (2) moderate dross films, (3) moderate lack of root fusion, (4) moderate, scattered fine dross, (5) severe lack of root fusion, (6) severe porosity, (7) moderate porosity, (8) severe, scattered fine dross, and (9) severe dross films.

AD-258 212 Div. 17
(14 June 61) OTS price $7.60

Battelle Memorial Inst., Columbus, Ohio.
TUNGSTEN EXTRUSION PROGRAM. A STATE-OF-THE-ART SURVEY.
Interim technical rept. no. 1, 2 Dec 60-2 Mar 61. 2 Mar 61, 1v. incl. illus. tables, 44 refs.
(Subcontract to Wah Chang Corp., Albany, Oreg., Contract AF 33(600)42395)
Unclassified report

DESCRIPTORS: *Tungsten, *Tungsten alloys, *Extrusion, Processing, Physical properties, Mechanical properties, Preparation, Melting, Powder metals, Powder metallurgy, Electric arcs, Electron beams, Lubricants, Induction heating, Tungsten wire, Airframes, Grains (Metallurgy), Production, Impurities, Tensile properties, Oxidation, Dies.

The state-of-the-art on the extrusion of W and its alloys is reviewed. A resume of physical and mechanical property data and present industrial capabilities for ingot production and extrusion practice is presented. Ingot and mill product preparation techniques are discussed. Both powder metallurgy and arc consolidation may be utilized to prepare small ingots. However, the consumable electrode arc-melting process is the only method being used to produce W ingot stock of sufficient size to warrant consideration. Limited mechanical property data is presented on W and several W base alloys. Recrystallization behavior and factors affecting ductile-to-brittle transition temperature are also discussed. It is reported that conventional extrusion experience on W and its alloys has been limited primarily to round bar at reduction ratios of less than 10:1. The major problem areas which must be overcome before a successful W tee extrusion can be obtained are the limitations in die materials, lubrication, and insufficient billet heating capability. (Author)

AD-258 241 Div. 17
(19 June 61) OTS price $2.50

Nuclear Metals, Inc., Cambridge, Mass.
DEVELOPMENT OF RANDOMLY ORIENTED WROUGHT BERYLLIUM SHEET,
by F. M. Yans, A. K. Wolff, and A. R. Kaufmann. Rept for 1 May 59-30 Apr 60 on Metallic Materials, Dec 60, 93p. incl. illus. tables, 33 refs.
(Contract AF 33(616)6616, Proj. 7351)
(WADD TR 60-403) Unclassified report

DESCRIPTORS: *Beryllium, *Sheets, Deformation, Crystal structure, Rolling mills, Heat treatment, Extrusion, Fracture (Mechanics), Processing, Forging, Mechanical properties, Crystallization, Single crystals, Plasticity, Microstructure, Microphotography.

Various factors affecting texture development in Be were studied in an effort to produce randomly oriented wrought Be sheet. Rolling experiments

indicated that the specimen geometry and rolling sequence affected the textures developed during working. It was determined that, during rolling, the basal plane population parallel to the plane of the sheet increased with reduction in area and, when certain specimens are heat treated at high temperatures for short times, the basal plane population parallel to the plane of the sheet is reduced. Further rolling and annealing studies performed on bi-directionally rolled sheet indicated that, when the sheet is subjected to annealing temperatures in excess of 950 C, the location of the basal plane peak intensity is shifted and the intensity profile changes considerably, yielding a third-dimensional ductility of 1.75%. It should be noted that the same sheet in only the stress-relieved condition possesses only 0.2% third-dimensional ductility. The same textural changes were observed in sheet samples manufactured by compression rolling. (Author)

AD-258 265 Div. 17, 27
(26 June 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL METHOD OF PRODUCING POROUS TUNGSTEN FOR ION ROCKET ENGINES,
by Neal T. Saunders. June 61, 23p. incl. illus. (NASA Technical note no. D-864)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-864.

DESCRIPTORS: *Tungsten, Porous metals, Production, *Ion rockets, Ion sources, Rocket propellants, Rocket propulsion, *Powder metals, Powder metallurgy, Sintering, *Electric propulsion, Porosity, Gas flow, Measurement, Preparation, Design, Rocket motors, Materials.

The effects of particle size and sintering temperature on the permeability of W ionizers were investigated. Tungsten powders of 1, 10, and 20 microns average particle size were sintered at temperatures in the range of 2250 to 2900 F. Results from density measurements, metallographic examination, and N flow tests on disks representing the various combinations of particle size and sintering temperature showed that porosity varies inversely with sintering temperature for 1-micron particles but that sintering temperatures up to 2900 F had no effect on the porosity of samples produced from 10- and 20-micron particles. A method of producing thin porous platelets was developed that utilizes the sintering of compacted 1-micron powder at 2750 F for 20 hr in an H atmosphere. Platelets manufactured by this method were successfully operated in an experimental ion engine. (Author)

AD-258 306 Div. 17, 31
(23 June 61) OTS price $15.00

Bureau of Ships, Washington, D. C.
BUREAU OF SHIPS CONFERENCE, HY-80 STEEL FABRICATION IN SUBMARINE CONSTRUCTION, AT BUREAU OF SHIPS 21-22 MARCH 1960.
1960, 221p. incl. illus. tables.
Unclassified report

DESCRIPTORS: *Conferences, *Submarines, *Steel, Design, Construction, Materials, *Welding, Electrodes, Tests, Quality control, Labor, Explosions, Arc welding, Alloys, Welding fluxes, Steel electrodes, Effectiveness, Analysis, *Symposia, *Submarine hulls.

Contents:
Investigation of weldability of Navy grade HY-80 steel; Flux developments for welding HY-80; Development of crack free electrodes for welding HY-80 steel; Some observations on the weldability of quenched and tempered high-yield-strength alloy steels; Fatigue properties of welds in HY-80 steel; Report of semi-automatic inert gas metal arc welding HY-80 steel out-of-position; The application of preheat to submarine construction; Report on the development of a crack resistant electrode for HY-80; Explosion test performance of small-scale submarine hull weldments; Explosion bulge test performance of experimental submerged-arc weldments of HY-80; Notch toughness evaluation of modified HY-80 in heavy gage plates; Effect of welding variables on the yield strength of 9018 weld metal; Quality control in the fabrication of HY-80 structures; Workmanship controls in the fabrication of HY-80 hulls.

18. MILITARY SCIENCES AND OPERATIONS

AD-257 603 Div. 18, 30
(14 June 61) OTS price $8.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
PROJECT TE/AS. CONCEPTUAL FORMULATION OF A GENERALIZED THREAT EVALUATION AND ACTION SELECTION FUNCTION,
by Myron L. Braunstein and Edwin W. Roth. May 61, 90p. incl. illus. tables, 31 refs. (Scientific rept. no. 1)
(Contract AF 19(604)7361)
(AFCRL-159)
Unclassified report

DESCRIPTORS: *Air force operations, Analysis, Probability, Statistical data, Coding, Programming, *National defense, Information theory, Warfare, *Air intelligence, *Data processing systems, Military operations, Operations research, *Military organizations, Military intelligence.

A generalized formulation is presented of the threat evaluation and action selection (TE/AS) function. Each subfunction of the TE/AS function is detailed as to the types of input information/data required, the form(s) of processing performed, and the outputs derived. A simplified tactical air defense problem is included to illustrate the principles and processing involved, and the basic forms of the inputs and outputs from each subfunction. It was qualitatively ascertained that the basic TE/AS formulation is applicable to all the aerospace missions to be performed within limited war environments. The result of the threat evaluation portion of the function is a set of threat categories and the probability of the current threat falling into each category. The action selection portion is initiated by the reception of the threat category data within the outcome intelligence subfunction. The output is a decision in terms of a resource commitment to be made to the specific threat. The decision is then implemented by system resource control. This decision-theoretic formulation assists the military commander in making tactical operational and near-term decisions. (Author)

19. NAVIGATION

AD-257 608 Div. 18
(14 June 61) OTS price $4.60

Human Sciences Research, Inc., Arlington, Va.
EVALUATION OF COMBAT SYSTEMS: ESTABLISHMENT OF CRITERIA AND THEIR USE IN SELECTION OF KEY SYSTEM FACTORS,
by M. Dean Havron. Mar 61, 45p. incl. illus. 26 refs. (Rept. no. 11, HSR-RR-61/3-Sm)
(Contract Nonr-252500)
Unclassified report

DESCRIPTORS: *Operations research, Theory, *Military operations, Military equipment, Design, *Naval operations, Naval equipment, *Air force operations, Air force equipment, Costs, Military requirements, Countermeasures, *Warfare, *Combat.

Three major problems inherent in evaluation of combat systems are studied: (1) the use of the logic of the combat engagement to derive criteria for systems evaluation; (2) the classification of variables of the system complex, conceived of here as independent variables or system factors that may be manipulated, and the relationships between these variables and system criteria; (3) the use of criteria derived from the engagement to predict the relative gain to be realized by improving subsystems and/or system elements. (Author)

AD-257 832 Div. 18, 15, 31, 33
(16 June 61) OTS price $7.60

George Washington U., Washington, D. C.
DETERMINING THE SIZE OF AN OCEAN SHIPPING PIPELINE MEETING A TIME-PHASED MILITARY REQUIREMENT SCHEDULE UNDER NON-CONVOY CONDITIONS,
by Ralph B. Hunt and Erling F. Rosholdt.
12 June 61, 16p. incl. table (Serial no. T-134/61)
(Contracts Nonr-76105 and Nonr-76106)
Unclassified report

DESCRIPTORS: *Merchant vessels, Cargo ships, *Shipping, *Logistics, Analysis, Military requirements, Scheduling, *Equations, *Water traffic.

AD-257 937 Div. 18
(20 June 61) OTS price $5.60

Rand Corp., Santa Monica, Calif.
SPARE PARTS INVENTORIES FOR NATO,
by Horst Mendershausen, 23 May 61, 53p. (Research memo. no. RM-2767)
(Contract AF 49(638)700, Proj. Rand)
Unclassified report

DESCRIPTORS: *Parts catalogs, Supplies, Logistics, Weapons, Procurement, Supply depots.

This study defines a number of features which ought to be possessed by jointly financed spare parts inventories operated for weapon systems common to NATO countries. It attempts to show the important problems that such an undertaking would face and systematically suggests solutions to them. The present study urges that the participating countries should build, in the NATO Supply Center, joint inventories for prompt service, and commit themselves to using these inventories fully. To achieve best results, materiel should be available to the users on requisition; certain procurement functions should be delegated by the countries; weapon system partnerships should be developed; and both purposes and inventory ranges clearly defined. Costs should be shared on a planned and equitable basis (outlined in the study). (Author)

AD-257 660 Div. 19, 15
(14 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NEWS OF THE INSTITUTIONS OF HIGHER EDUCATION - INSTRUMENT CONSTRUCTION (SELECTED ARTICLES).
31 Jan 61, 24p. incl. illus. tables (Trans. no. MCL-322 from Izvestiya Vysshika Uchebnykh Zavedeniy - Priborostroyeniye 5:69-83, 1958)
Unclassified report

DESCRIPTORS: *Gyroscopes, *Compasses, Instrumentation, Rotation, Mathematical analysis, Sensitivity, Equations, Differential equations, Motion.

Contents:
Floating 2-degree gryoscopic compass with elastic bearings of the precession axis, by M. A. Sergeyev
Dynamics of the magnetic compass on an aircraft, by A. F. Khokhlov

AD-257 744 Div. 19, 6
(16 June 61) OTS price $4.60

National Aviation Facilities Experimental Center, Atlantic City, N. J.
VIDEO TRACKING EXPERIMENTATION,
by Leo F. Stinson. Aug 60, 1v. incl. illus. tables.
Unclassified report

DESCRIPTORS: *Radar tracking, Radar targets, Radar scanning, Tracking, *Air traffic control systems, Data processing systems, Video signals, Plan position indicators, Instrumentation, Tests, Air control centers, Analog systems.

A test program was conducted on a breadboard Cartesian coordinate radar track-while-scan system to establish methods and means for measuring the pertinent characteristics of video tracking equipment. The breadboard tracking equipment from the U. S. Air Force Radar Approach Control II program was installed at the National Aviation Facilities Experimental Center. Various methods applicable to future technical evaluation programs on similar tracking systems were investigated. Tests were conducted to determine tracking accuracy as a function of target velocity and radial acceleration, the effects of tracking gate size on tracking performance, tracking limitations imposed by the presence of random noise, and a variety of other tracking functions. (Author)

AD-257 745 Div. 19, 1, 12, 26
(16 June 61) OTS price $5.60

General Electric Co., Philadelphia, Pa.
STUDY OF PARAMETERS WHICH AFFECT PELLET FLOW TYPE ACCELEROMETERS,
by William Nicolini. Monthly rept. no. 3, 1-31 Aug 60. Aug 60. 48p. incl. illus. tables.
(Contract DA 36-034-ORD-3230)
Unclassified report

DESCRIPTORS: *Accelerometers, Fluid flow, Pellets, Spheres, Glass, Processing, Surface properties, Friction.

During the month of August metal beads and glass beads for efflux testing at Philadelphia were separated, measured, and recorded for the fol-

lowing bead properties as defined by our test procedures: (a) Average diameter with 95% confidence limits; (b) Range of diameters for 30 beads; (c) Percent of beads within 1/4 mil and 1/2 mil of the average diameter, to 95% confidence limits; (d) Percent spherical beads; (e) Maximum bulk density; (f) Average bead density; (g) Percent voids at maximum packing; and (h) Photographs showing surface roughness, voids, size, and shape. Equipment and procedures were designed to obtain the above listed properties. Work was continued on the mathematical analysis of accelerometer performance, and procedures set up to clean equipment and beads. (Author)

AD-257 875 Div. 19, 6, 13
(20 June 61) OTS price $8.10

National Aviation Facilities Experimental Center, Atlantic City, N. J.
INSTALLATION AND TESTING OF VISUAL GLIDE PATH INDICATORS,
by Richard S. Griffith. Final rept. June 60, 1v. incl. illus. tables.
Unclassified report

DESCRIPTORS: Flight paths, Flight testing, Pilots, Aviation personnel, *Glide path systems, *Ground controlled approach radar, Visual perception, Vision, *Installation, Flight position indicators, Optical tracking, Optical equipment, Radar tracking, Instrumentation, Electronic equipment, Computers, Design, Tests, *Instrument landing, *Airplane landings, Runway lights.

AD-258 221 Div. 19
(26 June 61) OTS price $8.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
AN EXPERIMENTAL INVESTIGATION OF THE CALIBRATION OF ERRORS IN PREDICTED LINES OF POSITION OF LOW-FREQUENCY HYPERBOLIC NAVIGATION SYSTEMS,
by James O'Day, William Porter and Joseph Sullivan. June 61, 89p. incl. illus. tables.
(Rept. no. 2900-244-R)
(Contract DA 36-039-sc-78801, Proj. Michigan)
Unclassified report

DESCRIPTORS: *Hyperbolic navigation, Navigation, *Surveillance drones, Low frequency, Radio navigation, Errors, Reduction, *Calibration, Instrumentation, Mathematical prediction, Reliability, Tests, Design, Data processing systems, Flight testing, Radio waves, Propagation, Electromagnetic wave reflections, Statistical analysis, Shoran, Loran.

An experiment is described in the calibration of a low-frequency hyperbolic radio navigation system. It proposes that in low-frequency systems, irregularities in the true hyperbolic lines-of-position grids as compared with the predicted grids are of such a nature that regularly spaced calibration at reasonable intervals would significantly improve the accuracy of the system. A typical low-frequency system was chosen for the experiment, and a representative portion of the system service area was calibrated by an airborne measurement of position indication and true position throughout the test area. The low-frequency system, position-instrumentation system, and conduct of the experiment are described. The improved accuracy that can be obtained at various levels of calibration effort is discussed, and a method of determining the station spacing required for certain levels of accuracy is developed. (Author)

20. NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-257 685 Div. 20, 4, 25
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ATOMIC ENERGY (SELECTED ARTICLES) (Atomnaya Energiya).
Feb 61, 9p. incl. tables. (Trans. no. MCL-666 from Atomnaya Energiya 8:367-370, 1960)
Unclassified report

DESCRIPTORS: Thermodynamics, Thermochemistry, *Heat transfer, *Sodium, Measurement, Determination, Test equipment, Thermoelectricity, Alkali metals, Liquids, *Ion exchange, *Lithium, Radiochemistry, Ions, Isotopes, *Radioactive isotopes, Salts, Chlorides, Hydroxides, Benzoates, Citrates, Separation, USSR.

Heat transfer to Na at low Pe numbers, by M.S. Pirogov: Results are reported of tests on heat transfer to Na in a Cu tube over a range of Pe numbers from 17 to 416. The temperature of the Na inlet and outlet was measured by thermocouples. Special measurements revealed that the Te in the Na flow is uniform in these zones. The experimental conformed, with qualification, to the Martinelli-Lyons formula. Separation of Li isotopes in ordinary ion-exchange column, by G. M. Panchenkov, E. M. Kuznetsova, and L. L. Kozlov. Experimental and theroretical data are discussed. For a solution containing LiCl, $Li_3C_6H_5O_7$, $LiC_7H_5O_2$, and LiOH filtered in an ion exchange column where sulfonated coal in hydrogenous form acted as the ion exchanger, the isotopic ratio of the samples were 13.3, 14.4, 14.1, and 14.2, respectively. The theoretical determination of the critical volume for solutions of different Li salts is discussed.

AD-257 704 Div. 20, 8, 25
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CAPACITANCE GENERATORS AND THEIR APPLICATION AS HIGH VOLTAGE SOURCES OF ION ACCELERATORS (Kapacitni Generatory a Jejich Pouzity Jako Zdroje Vysokeho Napeti Pro Urychlovace Iontu)
by Karel Malek. 16 Jan 60, 17p. incl. illus.
(Trans. no. MCL-759 from Elektrotechnicky Obzor 45:138-144, 1959).
Unclassified report

DESCRIPTORS: Ions, *Ion accelerators, Particle accelerators, Electrostatic capacitance, *Electrostatic generators, Generators, Voltage, Design.

Generators operating on the principle of variable capacitance were analyzed with respect to their suitability as high voltage generators. The application of the generators to the acceleration of ions was investigated. A small capacitance generator was constructed, and the principle of cascade connection was evaluated.

AD-257 708 Div. 20, 25
(15 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THERMAL CALCULATION OF THE OPERATING CHANNEL OF A

NUCLEAR REACTOR,
by I. S. Kochenov. 20 Jan 61, 6p. (Trans. no. MCL-768 from Inzhenerno-Fizicheskiy Zhurnal; 2:64-67, 1959)
Unclassified report

DESCRIPTORS: *Research reactors, *Power reactors, *Heat transfer, *Thermodynamics, Thermal column, Nuclear reactions, USSR, *Heat exchangers.

AD-257 889 Div. 20, 16, 28
(21 June 61) OTS price $1.60

Advanced Electronics Center, General Electric Co., Ithaca, N. Y.
EXPERIMENTAL STUDY OF ATMOSPHERIC ION EFFECTS ON HUMAN BEHAVIOR,
by Allan H. Frey, Richard E. Granda, and Frederick L. Hiltz. Quarterly progress rept. no. 2, May 61, 12p.
(Contract Nonr-320200, Proj. NR 144-158)
Unclassified report

DESCRIPTORS: *Behavior, Ions, Atmosphere, Aerosols, Particles, Electric potential, Air, Gas flow, *Radiation tolerance, Ionization, Radiation injury, Measurement, Pathology, *Radiobiology, *Radiation effects, Personality.

The objectives of the study of atmospheric ion effects on human behavior are twofold; (1) to develop techniques to experimentally control interacting variables and (2) to identify a sensitive and reliable behavioral measure of ion effects. This report is primarily concerned with relating experience in developing techniques to experimentally control interacting variables. The results of the preliminary experiments will be briefly mentioned in this report but it is emphasized that no conclusion should be drawn from them. (Author)

AD-257 918 Div. 20, 25
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div. Washington, D. C.
LIQUID METALS AS HEAT CARRIERS.
22 May 61, 1p. (AID rept. 61-75, Trans. from On the Electrolytic Transfer of Oxygen in Liquid Sodium; Zhurnal Fizicheskoy Khimii 35:620-623, Mar 61)
Unclassified report

DESCRIPTORS: *Sodium, Liquids, *Sodium compounds, *Oxygen, Oxides, Ions, Heat transfer, Transport properties, *Electrolytes, Melting, *Reactor coolants, Reactor hazards, Corrosion, USSR, Liquid metals, Liquid metal cooled reactors, Impurities, Chemical impurities.

In connection with the known presence of Na20 in liquid sodium, which is often employed as a heat carrier, the possibility of electrolytic transfer of oxygen in the medium arises. This article describes an experimental check on this phenomenon conducted by the dc polarization method; the experiments were run at 300 C. An accumulation of transferred oxygen was actually determined in the anodic part of the molten metal. The findings confirmed the initial assumption that transfer is caused by O(--) ions, which originate from the strongly polarized molecule of Na20 and which are probably enclosed into a solvate-type envelope of Na(+) ions. (Author)

AD-257 928 Div. 20
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div. Washington, D. C.
NUCLEAR REACTOR.
5 June 61, 2p. incl. illus. (AID rept. 61-88, Trans. from Fast-Neutron Nuclear Reactor, Pravda, 1-2, 18 May 61; Fast-Neutron Nuclear Reactor, Pravda Ukrainy, 1, 18 May 61, and Subdual of Nuclear Fire, Komsomol'skaya Pravda, 1, 19 May 61)
Unclassified report

DESCRIPTORS: *Research reactors, USSR, *Fast neutrons, Uranium, Fission, Nuclear physics, Fast reactors.

A fast-neutron nuclear research reactor was put into operation by the Joint Institute of Nuclear Research, Dubna. Claimed to be the first of its kind, the reactor operates periodically in a supercritical state, achieved by providing the reactor with a movable core in addition to the stationary one. The movable core is made of uranium 235 in the form of a bushing pressed into a rotating disk. (Author)

AD-258 011 Div. 20, 25
(22 June 61) OTS price $1.10

Stevens Inst. of Tech., Hoboken, N. J.
AN EXPERIMENT TO MEASURE THE LIFETIME OF THE π^0 MESON,
by S. Taylor and E. L. Koller. 1961, 5p. incl. illus. table (Rept. no. SIT-P35 (5/61))
(Contract Nonr-306600)
Unclassified report

DESCRIPTORS: Particles, Mesons, *Pions, Pair production, Radioactive decay, *Radioactive mean life.

The experiment in progress is a measurement of the lifetime of the π^0 meson by the method of Harris, Orear, and Taylor (Phys. Rev. 106:327, 1957). The error in the result is still too large to indicate a clear separation from a lifetime of zero. However, the results are in good agreement with the results of other experimenters using the same methods at Naval Research Laboratory and Clarendon Laboratory, Oxford. (Author)

AD-258 018 Div. 20, 25, 30
(21 June 61) OTS price $1.10

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A METHOD FOR RECORDING NUCLEAR RESONANCE SPECTRA,
by T. R. Jeter and J. D. Baldeschwieler. Mar 61, 12p. incl. illus. tables (BRL Technical note no. 1394)
Unclassified report

DESCRIPTORS: Nuclear reactions, *Nuclear resonance, Nucleons, *Radioactive decay, Ion beams, *Ion accelerators, Energy, Gamma rays, *Gamma counters, Gamma emission, Control, Calibration, Instrumentation, Gamma ray spectra, Gamma proton reactions, Proton capture, Proton cross sections.

A method is described for continuously varying the Van de Graaff ion beam energy while the count rate from the decay of the compound nucleus is monitored and recorded. The method utilizes a synchronous motor system to synchronize the recorder and the magnetic field control of the Van de Graaff analyzing system. Use of this method results in significant time saving in calibration of the Van de Graaff accelerator and the determination of target thicknesses. (Author)

Division 20 - NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-258 021 Div. 20, 1
(20 June 61) OTS price $7.60

Convair, Fort Worth, Tex.
RADIATION EFFECTS FACILITY CAPABILITIES,
10 Mar 61, 72p. incl. illus. tables (Rept. no. NARF-61-7T; Rept. no. FZK-9-163)
Unclassified report

DESCRIPTORS: *Radiation effects, *Nuclear physics laboratories, Test equipment, *Light water reactors, Instrumentation, Safety, Radiochemistry laboratories, Aircraft nuclear propulsion, Shielding.

In 1951, the United States Air Force authorized construction of the Nuclear Aircraft Research Facility (NARF) at Convair, Fort Worth, Texas. From the very beginning, activities at NARF have been a part of the ANP Program. Under this program, two major areas of investigation have been of particular interest--nuclear shielding, and the effects of radiation on materials, components, and aircraft systems. To meet the diverse experimental requirements imposed by simultaneous efforts in these areas, two completely separate experimental systems and reactors have been designed and developed. This document describes the radiation effects experimental facilities at NARF. It has been prepared to serve as a guide to Convair personnel and to personnel from companies that participate in radiation effects tests at NARF. It contains information regarding the facilities that are available, their use, and the administrative practices that are involved in using them. As a background, a brief resume of the steps leading to the development of the present facilities is presented. (Author)

AD-258 082 Div. 20, 25
(22 June 61) OTS price $1.10

Vienna U. (Austria).
AN EXAMPLE OF NEGATIVE SIGMA PARTICLE CAPTURE WITH EMISSION OF A NEGATIVE PION,
by G. Kellner, G. Czapek, and B. Czapp. 29 Mar 61, 9p. incl. illus. tables (Scientific note no. 1.)
(Contract AF 61(052)433)
(AFOSR-856) Unclassified report

DESCRIPTORS: Particles, Mesons, *Hyperons, *Nuclear reactions, *Meson capture, Pions, Photographic emulsions, Instrumentation.

An event is described which consists in a slow singly charged particle of superprotonic mass interacting in flight with an emulsion nucleus producing a star with four visible prongs, one of them being a negative pi - meson. The event is consistent with the assumption that a negative hyperon captured by a nucleus interacts according to the reaction, a negative sigma particle plus a proton yields a lambda particle plus a neutron, the lambda particle being trapped in the target nucleus giving rise to mesonic breakup of the excited nucleus. (Author)

AD-258 143 Div. 20, 12, 25
(26 June 61) OTS price $9.10

Convair, Fort Worth, Tex.
A STUDY OF SHIELDING REQUIREMENTS FOR MANNED SPACE MISSIONS,
by J. W. Keller. 10 Oct 60, 1v. incl. illus. tables (Rept. no. FZK-124)
(Contract NASw-50)
Unclassified report

DESCRIPTORS: *Spaceships, *Space flight, *Shielding, Solar flares, Protons, *Van Allen radiation belt, Biological environment, *Space environmental conditions, Radiation hazards, Electrons, Cosmic rays, Bremsstrahlung.

The ramifications on shielding of manned space vehicles of the intense radiation environment in space was investigated. The radiation environment is reviewed and the problem of selecting shield materials in view of this environment is treated. The results of preliminary calculations to determine requirements for shielding against Van Allen radiation and solar protons are given. These results indicate that for most missions (outside the heart of the inner Van Allen belt) exposure to solar protons will be the controlling factor in determination of shield weight, suggesting the possible use of two crew compartments - one for normal operations and a smaller, heavily shielded one for short-term occupancy following solar flares. (Author)

AD-258 208 Div. 20, 25
(23 June 61) OTS price $1.60

Stanford U., Calif.
TRANSFER OF HELICITY IN RADIATION AND ABSORPTION OF HIGH-ENERGY PHOTONS,
by R. H. Pratt. Mar 61, 12p. (Technical note no. 37)
(Contract AF 49(638)388)
(AFOSR TN-663) Unclassified report

DESCRIPTORS: Electrons, *Photons, Nuclear moments, *Nuclear spins, Bremsstrahlung, *Nuclear reactions, Nuclear energy levels, Nuclear physics, Helixes, Absorption.

Nearly complete transfer of momentum between a high-energy electron (or positron) and a photon in a Coulomb field implies that helicity is also transferred. This is not a consequence of conservation of total angular momentum but, rather, of spin angular momentum, and follows from a demonstration that it is possible to use free-particle spinors (though not free wave functions) for the high-energy particles. Polarization correlations of the lower-energy particle in such a process are discussed. Applications are made to bremsstrahlung, pair production, photoeffect, and one-photon pair annihilation. (Author)

AD-258 210 Div. 20, 25
(23 June 61) OTS price $6.60

Stanford U., Calif.
THE GROUND STATE OF SOLID He3,
by Edward M. Saunders. May 61, 58p. incl. illus. (Technical note no. 39)
(Contract AF 49(638)388)
(AFOSR-783) Unclassified report

DESCRIPTORS: *Quantum mechanics, *Tritium, *Nuclear energy levels, Mathematical analysis, Helium, Isotopes, Solids, Solid state physics, Quantum statistics.

A ground-state wave function for solid He3 in the body centered cubic phase is calculated in the form of a product of single-particle orbitals and pair correlations. The correlation part is an eigenfunction of the Pluvinage Hamiltonian with each pair in a state of zero energy in a frame in which their center of mass is at rest. Assuming that exchange effects are small, we obtain an approximate single-particle probability function from this wave function. The many-body energy is obtained from this single-particle

probability function from basic principles by a plausibility argument, and leads to a pressure-volume relation that is in good agreement with observation. Exchange effects arise from the original wave function, when suitably anti-symmetrized. This predicts an exchange energy of about 0.005 K near the melting curve, in agreement with a recent experiment of Adams, Meyer, and Fairbank; this exchange energy favors anti-ferromagnetic alignment. (Author)

AD-258 247 Div. 20, 25
(21 June 61) OTS price $3.60

Institute of Metals and Explosives Research, U. of Utah, Salt Lake City.
THE EFFECT OF PRESSURE ON IONIZATION IN GASEOUS DETONATION,
by M. A. Cook, P. P. Bracke and R. T. Keyes.
31 Mar 61, 29p. incl. illus. tables.
(Contract AF 18(603)100)
(AFOSR-704) Unclassified report

DESCRIPTORS: *Detonation waves, Gases, Ionization, *Gas ionization, Pressure, Ions, Electrical conductance, Measurement, Hydrogen, Nitrogen, Oxygen, Carbon compounds, Mixtures, Detonation, Oxides, Electrons, Density, *Explosive gases, Explosions, High pressure research, Ionization potentials, Carbon compounds, Monoxides, Thermodynamics.

Electrical conduction measurements within detonation waves in the gaseous systems of 2H2-02-0.002 N2, 2H2-02-N2; and 2C0-02, were carried out over a range of detonation pressures extending to as high as 340 atm in order to determine the effect of pressure on ion density. The experimentally determined conductivities were compared with theoretical values that were calculated using Saha's equation to determine the equilibrium constants for the ionizing reactions. In the case of the 2H2-02-0.002 N2 and 2H2-02-N2 systems theory and experiment were found to agree at low pressure. However, a relatively abrupt rise with pressure of the experimental values above the theoretical ones occurred at about 20 and 50 atm for the 2H2-02-0.002 N2 and the 2H2-02-N2 systems, respectively. The difference between observed and computed values increased until at 250 atm the experimental electron densities were about 10 times greater than the calculated ones. (Author)

AD-258 253 Div. 20, 25
(19 June 61) OTS price $2.60

Nobel Inst. for Physics (Sweden).
ON NUCLEAR f5/2, p3/2, p1/2 LEVEL SPACINGS AND TRANSITION PROBABILITIES IN THE LEAD REGION,
by I. Bergstrom, C. J. Herrlander, and others.
1 May 61, 1v. incl. illus. tables (Technical note no. 5)
(Contract AF 61(052)118)
(AFOSR-851) Unclassified report

DESCRIPTORS: Nuclear physics, Nuclear reactions, *Nuclear energy levels, *Lead, *Isotopes, Electron capture, Radioactive decay, *Solid state physics, Probability.

A search for transitions of the type f5/2 to p1/2 and p1/2 to f5/2 has been made in Pb-205, Pb-203, Pb-201 and Hg-201. It is shown that this transition in Pb-205 has an energy of only 2.3 keV and goes directly to the f5/2 ground state. In Pb-203 the corresponding transition has an energy of 126 keV and a half-life of 75 + or - 3 ns. In Pb-201 and Hg-201 there was no evidence of a half-life longer than about 2 ns. It was essential to work out methods for a systematic search of half-lives in the ns-region in cases where the production of the nuclides to be studied leads to complicated mixtures of isotopes decaying by electron capture. Changes of the f5/2, p3/2 and p1/2 level spacings and transition probabilities with the nucleon number is studied and compared with theory. The agreement between experiments and the predictions of Kisslinger and Sorensen for Pb-205 and Pb-203 is shown to be fairly good. (Author)

AD-258 255 Div. 20
(19 June 61) OTS price $1.10

Naples U. (Italy).
INTERFERENCES AMONG FEYNMAN GRAPHS OF DIFFERENT TOPOLOGY,
by E. R. Caianiello and K. Y. Shen. 11 Apr 61, 7p. incl. illus. (Technical note no. 3)
(Contract AF 61(052)434)
(AFOSR-858) Unclassified report

DESCRIPTORS: Particles, *Quantum mechanics, Integral equations, *Topology, Perturbation theory, Series.

Whenever approximations are made with a theory that describes interactions of fermion fields - that is, when the graphs of a perturbative expansion which do not belong to some summable classes are dropped or, equivalently, the integral equations which become then the substitute for the exact theory are solved - the equation arises whether the exclusion principle is being treated correctly. If all the graphs which characterize the chosen approximation procedure are duly antisymmetrized in all the intermediate states, this does not suffice in general to secure that the exclusion principle be rigorously respected (as it is in the exact solution). A given graph, or partial sum of graphs, although usually regarded for computational purposes as a compact expression, is in fact a sum of contributions arising from all the individual modes of the free fermion fields; these contributions may be partly, or totally, cancelled by others that belong, in the graphical picture, to diagrams which are disregarded by the approximation chosen. (Author)

AD-258 270 Div. 20, 7
(23 June 61) OTS price $19.75

Alco Products, Inc., Schenectady, N. Y.
SM-2 6000 AND 12000 eKW NUCLEAR POWER PLANT PRIMARY SYSTEM DESIGN,
by E. F. Phelps. 1 June 61, 1v. incl. illus.
(APAE rept. no. 74, vol. 1)
(Contract DA 44-192-eng-7)
Unclassified report

DESCRIPTORS: *Nuclear power plants, *Electric power production, Power plants, *Water boiler reactors, *Steam power plants, Decontamination, Radioactive waste disposal, Design, Instrumentation, Shielding, Thermodynamics, Feed water, Boilers, Steam pipes, *Pressurized water reactors, Reactor safety systems.

Development studies for an SM-2 Nuclear Power Plant primary system are summarized. The studies include the following: horizontal steam generator, safety and alarm system, decontamination methods, waste disposal, preassembly and packaging, vapor container, vertical steam generator and feedwater control system, pressurizer development and design studies, fuel handling, superheater, and instrumentation. The design analysis for the main

primary system and the primary auxiliary system is presented with calculations, sketches and descriptions. The results obtained from the development studies and design analysis are included for a 6000 eKW plant design which utilizes a single 28 tMW reactor system, and for the preliminary design of a 12,000 eKW plant design which utilizes two identical 28 tMW reactor systems. (Author)

AD-258 271 Div. 20, 7
(23 June 61) OTS price $18.50

Alco Products, Inc., Schenectady, N. Y.
SM-2 6000 AND 12000 eKW NUCLEAR POWER PLANT PRIMARY SYSTEM DESIGN ANALYSIS CALCULATIONS,
by E. F. Phelps. 1 June 61, 1v. incl. illus.
(APAE no. 74, vl. 2)
(Contract DA 44-192-eng-7)
Unclassified report

DESCRIPTORS: *Nuclear power plants, *Electric power production, Power plants, *Water boiler reactors, *Steam power plants, Thermodynamics, Shielding, Steam pipes, Heat transfer, *Pressurized water reactors.

Contents:
Steam generator calculations
Primary piping calculations
Primary shielding calculations
Vapor container calculations
Fuel handling tools calculations
Latch rod and screw calculations
Primary heat balance calculations
Secondary heat balance calculations
Primary auxiliary calculations
Primary skid-structural calculations
Auxiliary skid-structural calculations
Primary purification and makeup system calculations
Primary system materials
Electrical design analysis

AD-258 272 Div. 20, 7
(23 June 61) OTS price $19.75

Alco Products, Inc., Schenectady, N. Y.
SM-2 6000 eKW (NET) NUCLEAR POWER PLANT - FINAL DESIGN SECONDARY SYSTEM,
by E. F. Phelps. 1 June 61, 1v. incl. illus.
(APAE rept. no. 74, vol. 3)
(Contract DA 44-192-eng-7; In cooperation with Loftus, Peter F., Corp., Pittsburgh, Pa.).
Unclassified report

DESCRIPTORS: *Nuclear power plants, *Electric power production, Power plants, *Water boiler reactors, *Steam power plants, Electrical engineering, Civil engineering, Generators, Transmission lines, Turbines, *Pressurized water reactors.

A design analysis study of the SM-2 secondary plant equipment was undertaken to develop an SM-2 Final Design. Equipment sizes are based on utilization of a 28 tMW Pressurized Water Reactor and a 7500 eKW turbo-generator. Drawings showing equipment arrangement and over-all plant layout are provided. Studies were made on mechanical, structural and electrical design and all calculations are shown in the appendices of their respective sections. (Author)

AD-258 273 Div. 20, 7
(23 June 61) OTS price $12.50

Alco Products, Inc., Schenectady, N. Y.
SM-2 12000 eKW POWER COMPLEX NUCLEAR POWER PLANT SECONDARY SYSTEM DESIGN,
by E. F. Phelps. 1 June 61, 1v. incl. illus.
(APAE rept. no. 74, vol. 4)
(Contract DA 44-192-eng-7; In cooperation with Loftus, Peter F., Corp., Pittsburgh, Pa.)
Unclassified report

DESCRIPTORS: *Nuclear power plants, *Electric power production, Power plants, *Water boiler reactors, *Steam power plants, Electrical engineering, Civil engineering, *Pressurized water reactors, Steam pipes.

A design analysis of the secondary system of the SM-2 12,000 eKW (net) Power Complex, Nuclear Power Plant is presented. Studies of the mechanical, structural, and electrical engineering designs were performed. Equipment sizes are based on using two 28 tMW pressurized water reactors and five 5000 KVA generators, with four normally operating at 3/4 load. Drawings, showing equipment arrangement and over-all plant layout, and calculations were prepared prior to June 30, 1960. The drawings and design analysis are not complete, but will be used as the basis of the final design of the SM-2 12,000 eKW (net) Power Complex. (Author)

AD-258 324 Div. 20, 25
(22 June 61) OTS price $2.60

Ecole Normale Superieure (France).
THE LOW ENERGY PION-PION INTERACTION I.
by J. G. Taylor. Jan 61, 24p. incl. illus.
(Technical note no. 23)
(Contract AF 61(052)173)
(AFOSR-655)
Unclassified report

DESCRIPTORS: *Nuclear physics, Nuclear magnetic resonance, Particles, Mesons, *Pions, *Meson scattering, Nucleons, Integral equations, Nuclear energy levels.

Contents:
Equations for the S and P wave amplitudes
The iteration procedure
Relation to the N/D technique
Crossing symmetry
Discussion of resonances

21. NUCLEAR PROPULSION

AD-257 931 Div. 21, 7, 9, 20, 30
(21 June 61) OTS price $1.60

Science and Tech. Section, Air Information Div., Washington, D. C.
SOVIET NUCLEAR INSTRUMENTATION AND CONTROL FOR PROPULSION.
Monthly rept. no. 5, 10 Apr-10 May 61. 17 May 61, 12p. incl. illus. (AID rept. 61-76)
Unclassified report

DESCRIPTORS: *Nuclear propulsion, *Pneumatic devices, Electronic equipment, Hydraulic systems, Control, *Detectors, Instrumentation, USSR, *Electromechanical converters.

Material made available during the period 10 April to 10 May, 1961 is discussed. The following topics are treated: detectors, control components including both electromechanical and pneumatic.

22. ORDNANCE

AD-257 602 Div. 22
(14 June 61) OTS price $1.60

Army Arctic Test Board, Fort Greely, Alaska.
SERVICE TEST OF AIR DELIVERY AND AIR TRANSPORT OF THE ROLLING FLUID TRANSPORTER, 1,000-GALLON CAPACITY.
16 May 61, 14p. incl. illus.
(Proj. no. ATB 3-141)

Unclassified report

DESCRIPTORS: *Fuels, Liquids, Air drop operations, *Air transportation, *Containers, Synthetic rubber, Arctic regions, Tests.

Service tests were made to determine the suitability of the Rolling Fluid Transporter, 1,000-Gallon Capacity for air delivery and air transport under arctic winter conditions. It is concluded that: (a) The fluid transporter (T3) is suitable for air transport, parachute delivery, and external transport by helicopter under arctic winter conditions; and (b) The procedures and techniques developed for parachute delivery and air transport of the fluid transporter (T3), for use in temperate climates are suitable for Army use under arctic winter conditions. (Author)

AD-257 682 Div. 22
(14 June 61) OTS price $15.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THEORY OF FLIGHT OF UNGUIDED ROCKETS (CHAPTERS 2, 3, 4, 7 AND 9),
by F. R. Gantmakher and L. M. Levin. Feb 61, 225p. incl. illus. tables. (Trans. no. MCL-651 from Gosudarstvennoye Izdatel'stvo Fiziko-Matematicheskoy Literatury Moscow:pp. 24-150, 215-236; 254-276, 1959)

Unclassified report

DESCRIPTORS: Dynamics, *Rockets, Spin stabilized ammunition, Antitank ammunition, *Rocket trajectories, Gravity, *Exterior ballistics, *Terminal ballistics, Drag, Stability, Theory, Mathematical analysis, Aerodynamics, Rocket propulsion.

Contents:
Equations of rocket motion
Calculation of a rocket trajectory
Principles of the theory of rocket dispersion
Dispersion of fin-stabilized rockets
Dispersion of slowly rotating fin-stabilized rockets
Dispersion of Antitank Fin-stabilized rockets
General (three-dimensional) problem of rocket motion
Spin-stabilized rockets
The effect of wind on rocket flight
Formulas for additional forces in equations of motion of rockets
Missile aerodynamics

AD-257 720 Div. 22
(16 June 61) OTS price $1.60

Aberdeen Proving Ground, Md.
ARCTIC WINTER ENVIRONMENTAL TEST OF IGNITER, TIME BLASTING FUSE, WEATHERPROOF, M60,
by Gerald B. Podlin. June 61, 10p. incl. illus. tables (Rept. no. DPS/OTA-92)
(Proj. no. 598-09-004)

Unclassified report

DESCRIPTORS: *Igniters, Arctic regions, Tests, Underwater, Air, Storage, *Fuse lighters, Time delay fuzes.

Thirty M60 igniters were tested in groups of ten each after 21, 41, and 55 days of arctic weathering. Twenty-seven of the thirty units functioned satisfactorily. The three failures did fire, but failed to ignite the safety fuse. Control groups consisted of nine igniters stored indoors under moderate conditions and ten placed in arctic storage. All indoor control and nine of the ten outdoor control units functioned satisfactorily. The M60 igniter is considered satisfactory for use under arctic conditions. (Author)

AD-257 805 Div. 22
(16 June 61) OTS price $4.60

Philco Corp., Willow Grove, Pa.
SUBSYSTEM SS1A (AUTOMATIC DATA PROCESSING SYSTEM FOR FIELD ARTILLERY APPLICATIONS),
by H. Glazer and F. Ungerman. Quarterly progress rept. no. 3, 1 Jan-31 Mar 61. 31 Mar 61, 1v. incl. illus.
(Contract DA 36-039-sc-85146)

Unclassified report

DESCRIPTORS: *Data processing systems, Fire control computers, *Artillery, Programming, Artillery fire, *Communication systems, Data storage systems, *Communication equipment, Memory devices, *Display systems, Automatic, Computers, Design.

This report includes:
Stelma, Inc., Stamford, Conn.
DEVELOPMENT OF MESSAGE ENTRY DEVICE SS1A. Quarterly rept. no. 2, 1 Jan-31 Mar 61. Mar 61, 20p. incl. illus.
(Subcontract to Philco Corp., Willow Grove, Pa. Contract DA 36-039-sc-85146)

Stelma, Inc., Stamford, Conn.
DEVELOPMENT OF DIGITAL DATA TERMINAL AN/TYC-1 (MOD). Quarterly progress rept. no. 2, 1 Jan-31 Mar 61.
(Subcontract to Philco Corp., Willow Grove, Pa., Contract DA 36-039-sc-85146).

Servomechanisms Inc., Westbury, N. Y.
FORWARD AREA DISPLAY UNIT. Quarterly rept. no. 2, 1 Jan-31 Mar 61. 31 Mar 61, 13p.
(Subcontract to Philco Corp., Willow Grove, Pa., Contract DA 36-039-sc-85146)

AD-257 838 Div. 22, 14, 29
(16 June 61) OTS price $1.60

Aberdeen Proving Ground, Md.
ARCTIC WINTER TESTS 1961, OF HATCH HOODS FOR COMBAT VEHICLES,
by Roger D. Barnhart. June 61, 19p. incl. illus.
(Rept. no. DPS/OTA-72)
(Proj. 598-09-004)

Unclassified report

DESCRIPTORS: Armored vehicles, Temperature, De-icing systems, Effectiveness, *Pneumatic devices, Arctic regions, Installation, Materials, Tests, Maintenance, *Tanks, *Protective coverings, Windshield wipers.

A universal hatch hood was installed on an M60 tank which was operated 1002 miles over various test courses in ambient temperatures ranging from +5 F to -31 F. Design, comfort, operation, durability and defrosting characteristics were observed. The hatch hoods tested are not suitable

for use in the arctic without further improvements. It is recommended that the hood be redesigned to correct the deficiencies noted and retested under winter arctic conditions. (Author)

AD-258 001 Div. 22
(21 June 61) OTS price $1.60

Aberdeen Proving Ground, Maryland.
TEST OF 7.62-mm, M73C MACHINE GUN AND CRADLE FOR M31C PEDESTAL MOUNT ON TRUCK, 1/4 TON, M38A1,
by E. Gayler. June 61, 1v. incl. illus. (Rept. no. DPS-251)

Unclassified report

DESCRIPTORS: *Small arms, *Automatic weapons, *Gun mounts, Tests, Vehicles.

A test was conducted to determine whether any difficulties would arise in the installation or use of the mount and gun combination on the truck. Ten groups of 29 rounds each were fired for accuracy; 400 rounds were fired from the moving truck to determine truck, mount, and gunner compatibility; and 3000 rounds were fired for weapon-mount endurance. Problem areas encountered were the lack of a depression stop, a muzzle blast hazard which exists if the weapon is fired forward with personnel in the front seats, and the difficulty in removing the receiver group while the weapon is secured in the cradle. (Author)

AD-258 012 Div. 22, 30
(22 June 61) OTS price $10.10

Universal Match Corp., St. Louis, Mo.
DEVELOPMENT OF METHOD FOR MEASUREMENT OF SENSITIVITY OF EXPLOSIVES TO FRICTION,
by H. R. Weisbrod. Final summary rept. for 27 Jan 59-27 July 60. 20 Feb 61, 122p. incl. illus., tables.
(Contract DA 23-072-ORD-1397, Proj. TB3-0115A)

Unclassified report

DESCRIPTORS: *Explosives, *Lead compounds, *Styphnates, *Azides, Friction, Sensitivity, Stresses, Impact shock, Moisture, Ignition, Test facilities, Test methods, Measurement, Tests, Reliability, Detonation, Particles, Powders, Test equipment, *Tetrazenes.

Project TB3-0115A was established to evaluate a method for measuring friction sensitivity of explosives using a Friction Apparatus. The apparatus provides friction energy from a falling pendulum. An explosive sample is placed between steel blocks and a compressive load is applied. Subsequent release of the pendulum transfers the upper block. Preliminary tests were performed with tetrazene, lead azide and lead styphnate. Test parameters were: applied load, pendulum velocity and weight, friction block surface finish, sample weight and distribution, and sample moisture content. A 50 shot Bruceton test procedure was used to establish the 50% no-fire load level. Although some correlation was found between applied load, pendulum velocity and friction sensitivity, the bulk of the data indicates an excessively wide standard deviation and poor repeatability. Tests revealed problem areas in the apparatus design. (Author)

AD-258 141 Div. 22
(23 June 61) OTS price $.75

Watervliet Arsenal, N. Y.
STRENGTH AND ECONOMIC COMPARISON OF AUTOFRETTAGED VERSUS JACKETED PRESSURE VESSEL CONSTRUCTION,
by T. E. Davidson and D. P. Kendall. Oct 60, 28p. incl. illus. (Technical Rept. no. WVT RI 6002-I)

Unclassified report

DESCRIPTORS: *Guns, Economics, Elasticity, *Gun barrels, Pressure, Theory, Howitzers, Stresses, Production, Construction, Pressure vessels.

The theoretical elastic strength of autofrettaged and jacketed thick-wall cylinders is presented in the form of equations and graphs. The mechanism by which both processes increase the elastic strength of a thick-wall cylinder is discussed and illustrated graphically. The advantages of a combination of jacketing and autofrettage for very thick-wall, pressure vessel applications are discussed and illustrated by a specific example. The economic advantages of autofrettage over jacketing are presented by a cost analysis of two specific examples, namely the 175mm Gun, T256 and the 155mm Howitzer T255. (Author)

AD-258 201 Div. 22
(26 June 61) OTS price $3.60

Institute of Metals and Explosives Research, U. of Utah, Salt Lake City.
MEASUREMENTS OF SHOCK AND DETONATION PRESSURES,
by M. A. Cook, R. T. Keyes, and W. O. Ursenbach. 28 Apr 61, 29p. incl. illus. tables, 19 refs.
(Contract NOw-61-0411-d)

Unclassified report

DESCRIPTORS: *Detonation, Measurement, Pressure, *Detonation waves, Explosions, Photographic analysis, Velocity, Aluminum, Particles, Surfaces, Surface properties, Determination, Water, Blast, Underwater explosions.

An aquarium technique for the measurement of shock and detonation pressures is described which is capable of measuring accurately pressures over a range extending from roughly one to several hundred kilobars. An experimental determination of the equation of state for water, upon which use of the aquarium technique relies, is presented and compared with results obtained by other investigators. Similar data are presented for lucite. Measurements of pressures at the detonation front for a variety of explosives including both ideal and nonideal ones are presented for various charge diameters and lengths using explosives of widely different reaction zone lengths. These pressures were found to correspond to the Chapman-Jouguet value of the detonation pressure calculated from thermohydrodynamic theory. (Author)

AD-258 205 Div. 22, 8, 25
(23 June 61) OTS price $2.60

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
RESEARCH PROGRAM ON CONVERSION OF EXPLOSIVE ENERGY,
by S. J. Lukasik. Quarterly progress rept. Oct-Dec 60. Dec 60, 27p. incl. illus. tables.
(Contract DA 28-017-501-ORD-3450)

Unclassified report

DESCRIPTORS: *Explosives, *Detonation, Resistance, *Gases, Magnetic fields, Energy, Measurement, Tests, *Conductivity, Vacuum systems, *Capacitors, Mathematical analysis, Calibration.

Magnetic field compression experiments were continued, using an interim 1000 joule bank. The circuit parameters of this system were investigated to calculate the magnetic field in the load prior to its explosive compression. The signals induced in the pick-up loop during the firing were then analyzed in terms of a simple model picturing a constant total flux trapped in an area that is decreasing due to the expansion of the copper-clad explosive. The most successful compression was from an initial field of 4700 gauss to a final field of 38,500 gauss, or by a factor of 8.2. Efforts to obtain higher magnetic fields by redesigning the load coil and explosive piston and by working toward a higher initial magnetic field are continuing. Conductivity studies are being directed toward removing possible secondary effects in the conductivity measurements. These include the confinement of the detonation and consequent changes in the reaction zone due to the structure supporting the double probes and the T-probes, the effect of the T-probe plate thickness, the difference between internal and surface conductivity measurements, and air-shock induced conductivity. (Author)

AD-258 327 Div. 22
(23 June 61) OTS price $3.60

Aberdeen Proving Ground, Md.
ARCTIC WINTER ENVIRONMENTAL TEST OF CARTRIDGE, ILLUMINATING, 81-mm, T214E2, WITH FUZE, TSQ, M77E1, FOR MORTAR, 81-mm, M29,
by G. B. Podlin. June 61, 1v. incl. illus. tables (Rept. no. DPS/OTA-85)
Unclassified report

DESCRIPTORS: *Cartridges, *Illuminating projectiles, Fuzes, Tests, Arctic regions, Climatic factors, Reliability.

Fifty rounds of Cartridge, Illuminating T214E2, were fired in groups of ten rounds each, with varying elevations and charges. Firings were conducted to determine range accuracy, fuze timing, and functioning characteristics under arctic winter conditions. Seventy-six percent of the rounds functioned satisfactorily. Malfunctions were primarily attributed to fuze faliure. The average illumination time was one hundred-nine seconds and the average rate of descent was eleven feet per second. The T214E2 shell is considered satisfactory and the M77E1 fuze unsatisfactory for use under arctic winter conditions. It is recommended that a fuze of greater reliability under arctic winter conditions be designed to mate with the T214E2 shell. (Author)

AD-258 330 Div. 22
(23 June 61) OTS price $8.10

Aberdeen Proving Ground, Md.
EFFECT OF TUBE WEAR ON ROUND TO ROUND DISPERSION IN 90-MM TUBES, M41, WITH SHELL, HEAT, T300E55,
by T. A. Dolton. June 61, 1v. incl. illus. tables (Rept. no. DPS-226)
Unclassified report

DESCRIPTORS: Cartridges, High explosive ammunition, Antitank ammunition, *Gun barrels, Deterioration, Erosion, Tests.

This report covers a series of firings conducted on six M41 tubes with stages of remaining service life varying from 65 to 12% using Shell, HEAT, 90-mm, T300E55. Results indicated that tube wear had little effect upon accuracy between 65% and 33% remaining service life. There was no indication that tube wear affected dispersion between 65 and 33% remaining life. The results in the last quarter of tube life were inconclusive. (Author)

23. PERSONNEL AND TRAINING

AD-257 925 Div. 23, 30
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div. Washington, D. C.
NEW PRESIDENT OF THE SOVIET ACADEMY OF SCIENCES. 25 May 61, 2p. (AID rept. 61-85, Trans. from the President of the Academy of Sciences USSR; Matislav Vsevolodovich Keldysh. Pravada 2, 20 May 61).
Unclassified report

DESCRIPTORS: *USSR, *Scientific organizations, *Scientific personnel, Leadership, Research program administration.

AD-258 027 Div. 23, 30
(21 June 61) OTS price $8.60

University of Southern Calif., Los Angeles.
FIELD EVALUATION OF A TROUBLE-SHOOTING TRAINING PACKAGE,
by Joseph W. Rigney, Donald H. Schuster and others. Apr 61, 92p. incl. illus. table. (Technical rept. no. 32)
(Contract Nonr-22822, Proj. NR 153-093)
Unclassified report

DESCRIPTORS: *Training, *Training devices, Maintenance personnel, *Radar trainers, Learning, Radar operators, Teaching machines.

Two field studies of a training package designed to improve the trouble-shooting proficiency of electronics technicians were conducted. The package consisted of refresher lectures on loran and radar circuits, general trouble-shooting principles and trouble-shooting training problems in a programmed-learning format, and criterion problems. It was found that a week of training with the package significantly improved trouble-shooting proficiency, as measured both by end-product scores and process scores. The end-product scores were number of problems solved, number of moves taken, and elapsed time; the process scores were based on the number of best and worst moves made, as proportions of the total moves attempted while solving the criterion problems. Responses to a questionnaire completed by the technicians at the end of training indicated that these men were generally in favor of the training method. (Author)

AD-258 304 Div. 23, 1
(23 June 61) OTS price $3.60

Air Force Proving Ground Command, Eglin Air Force Base, Fla.
BIOASTRONAUTICS STUDY OF B-58 MAINTENANCE TRAINING. CATEGORY III SYSTEM OPERATIONAL TEST AND EVALUATION,
by Jefferson F. Lindsey. May 61, 31p. incl. illus. (APGC TN 61-8)
(Proj. 102AH2)
Unclassified report

DESCRIPTORS: *Astronautics, *Maintenance, *Training, Weapons, *Maintenance personnel, Effectiveness, Bombers, Aviation personnel, Jet bombers, Jet planes.

This study is one of a series of studies conducted by the Bioastronautics Office, APGC, during the Category III System Operational Test and Evaluation of the B-58 Weapon System. The primary purpose of this study was to evaluate the training received by maintenance personnel assigned to the 43rd Bombardment Wing (Medium), Carswell AFB, Texas, and to determine the adequacy of this training relative to support of a B-58 tactical wing. The study was limited to the career fields in which most of the maintenance personnel are working. An analysis was made of personnel records, returns from questionnaires, and surveys of the various training facilities. Specific recommendations were then prepared for improving B-58 maintenance training. (Author)

24. PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

AD-258 149 Div. 24, 18, 30
(21 June 61) OTS price $6.60

Thompson Ramo Wooldridge, Inc., Canoga Park, Calif.
IMAGE FORMAT CONSIDERATIONS IN PHOTOGRAPHIC INTELLIGENCE PROCESSING. METRICARD DESIGN, by A. W. Richmond. 12 Apr 61, 55p. incl. illus. table (DSPO technical note no. 14)
(Contract AF 30(602)1814)
(RADC TN 61-63) Unclassified report

DESCRIPTORS: Aerial photography, Aerial reconnaissance, *Photographic intelligence, *Optical images, Effectiveness, Quality control, *Photographic film, *Data storage systems, Handling, Punched card methods, Processing.

The significance of the format of photos, maps, charts, and other graphic data is discussed in terms of the effects on efficiency of photo data reduction systems. The varied functions in such systems suggest many different format defining parameters. These parameters and their interrelationships are considered for the purpose of identifying formats of maximum utility for all such functions. It is concluded that a wide range of photo data reduction activities can effectively be accomplished with one standard size of unit record prepared from 70 millimeter roll film and containing an image with a minimum dimension very close to 2.25 inches. The other dimension of the image may require variation from 2.25 in. to a value about one-third larger to meet various geometrical and technical considerations. A description of such a standard format (Metricard) is presented. This format was designed to meet the requirements of photo data reduction systems emphasizing the features of rapid handling, moderate storage volume, and high information density. (Author)

AD-258 302 Div. 24, 4
(26 June 61) OTS price $1.60

Ansco Div., General Aniline and Film Corp., Binghamton, N. Y.
INVESTIGATION OF THE PHOTOPOLYMERIZATION PROCESS, by Frank J. Kaszuba, E. Cerwonka, and A. K. Schweria. Quarterly rept. no. 4, 15 Dec 60-15 Mar 61. 15p. incl. tables.
(Contract DA 36-039-sc-84927)
Unclassified report

DESCRIPTORS: *Photographic chemicals, Light, *Photochemical reactions, *Polymerization, Coatings, Photographic emulsions, Photosensitivity, Gels, Peroxides, Catalysis, Metalorganic compounds, Processing, Military requirements, Photographic paper, Storage.

An attempt was made at the practical utilization of the previously reported photoreducible ferric salts of alpha-hydroxy carboxylic acids. It was found that such salts, in the presence of peroxide, cause indiscriminate insolubilization of the photopolymerizable matrix. Introduction of the alpha-hydroxy carboxylic acid grouping into a phenol gives rise to a light sensitive ferric salt the anion of which is a color coupler. Colorless photoresists are obtained which can be made more visible by treatment with oxidized color developer of the p-phenylenediamine type. It was shown that processing of an exposed photopolymerizable layer with peroxide under reduced pressure reduces the minimum exposure time required to produce a photoresist by a factor of five. The ferric salt of vinyl glycolic acid does not form a polymer. Other miscellaneous experiments involved the study of systems containing lead or manganese dioxide, vanadyl salts, or mercury compounds. (Author)

25. PHYSICS

AD-257 656 Div. 25, 20
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SECONDARY EMISSION OF NEGATIVE PARTICLES IN THE BOMBARDMENT OF EXTRANEOUS LAYERS ON PURE METALS BY IONS OF ALKALINE ELEMENTS (O Vtorichnoy Emissii Otritsatel'Nykh Chastits Pri Bombardirovke Ionami Shchelochnykh Elementov Inorodnykh Plenok Na Chistykh Metallakh)
by U. A. Arifov, A. Kh. Ayukhanov, and S. V. Starodubtsev. 16 Feb 61, 14p. incl. illus. (Trans. no. MCL-298 from Izvestiya Akademii Nauk USSR, Seriya Fiziko-Matematicheskikh Nauk 2:107-115, 1958)
Unclassified report

DESCRIPTORS: *Secondary emission, Ions, Electrons, Ion beams, *Ion bombardment, Metals, Particles, Solid state physics, Alkaline earth metals, Measurement.

A special study is presented of the secondary emission of negative particles from surfaces in a migration from one pure metal (the basic target) to another pure metal (the layer in a process of subsequent depositing of one metal on another) in bombardment by position ions of alkaline elements. (Author)

AD-257 657 Div. 25, 20
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
A COMPARATIVE STUDY OF THE ELECTRONIC EMISSION OF METALS UNDER THE ACTIVITY OF BOMBARDMENT BY IONS OF INERT GASES AND ALKALINE ELEMENTS IN THE REALM OF ENERGY UP TO 10 KILO-ELECTRON-VOLTS (Srvnitel'noye Issledovaniye Elektronnoy Emissii Metallov Pod Deystviyem Bombardirovki Ionami Inertnykh Gasov i Shchelochnykh Elementov),
by U. A. Arifov and R. Rakhimov. 16 Feb 61. 13p. incl. illus. (Trans. no. MCL-299 from Izvestiya Akademii Nauk USSR, Seriya Fiziko-Matematicheskikh 6:49-55, 1958)
Unclassified report

DESCRIPTORS: *Secondary emission, Molybdenum, Tantalum, Tungsten, Electrons, *Ion bombardment, Ion beams, Magnetrons, Measurement, Solid state physics, Alkaline earth metals, Metals, Particles.

Results of comparative studies on secondary electron emission of molybdenum, tantalum and tungsten - under the activity of bombardment by ions of inert gases and alkaline elements in the realm of energy from 0.1 to 10 kilo-electron-volts - are stated. (Author)

AD-257 658 Div. 25, 20
(14 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NEWS OF THE UZBED SSR ACADEMY OF SCIENCES, PHYSICOMATHEMATICAL SERIES (SELECTED ARTICLES).
17 Feb 61. 31p. incl. illus. (Trans. no. MCL-301 from Izvestiya Akademii Nauk, Uzbekskoy SSR, Seriya Fiziko-Matematicheskikh Nauk 5:pp. 5-13, 15-22, 1958)
Unclassified report

DESCRIPTORS: *Secondary emission, *Ion bombardment, Metals, Solid state physics, Molybdenum, Magnetrons, Ion beams, Electrons, Measurement, Thermionic emission.

Contents:
Problem on the presence of potential emission of electrons in the bombardment of metals by ions of inert gases
About the methods of investigating the secondary processes caused by ions at high temperature of targets in the presence of thermionic emission

AD-257 661 Div. 25, 5, 16, 24
(14 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INVESTIGATIONS ON REPLACING THE SUBJECTIVE PICTURE QUALITY DETERMINATION BY A PHYSICAL CRITERIUM,
by Werner Kroebel and George Moll. 1 Mar 61, 27p. incl. illus. tables (Trans. no. MCL-396 from Zeitschrift Fuer Angewandte Physik 11:27-35, Jan 59)
Unclassified report

DESCRIPTORS: *Pictures, *Optics, Optical images, Sensory perception, Instrumentation, *Visual perception, Visual acuity, Focusing, Visibility.

AD-257 668 Div. 25, 4, 7, 8
(14 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SOLID STATE PHYSICS (SELECTED ARTICLES).
31 Oct 60, 33p. incl. illus. tables. (Trans. no. MCL-472 from Fizika Tverdogo Tela 1:pp. 1562-1572; 1573-1582, 1959)
Unclassified report

DESCRIPTORS: *Solids, *Solid state physics, Dielectrics, Polarization, Electrical properties, Magnetic properties, *Ferroelectric materials, *Ferromagnetic materials, Oxides, Lattices, Metals, Synthesis, *Complex compounds, Crystal structure, Crystals.

Contents:
Dielectric polarization of some complex compounds
Ferroelectric subtraction substitutional solid solutions

AD-257 677 Div. 25, 17
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONCERNING THE CONNECTION BETWEEN CERTAIN THERMAL FEATURES OF SOLIDS,
by V. S. Neshpor. 10 Jan 61, 10p. 10 refs. (Trans. no. MCL-493 from Fizika Metallov I Metallovedeniye 7:559-564, 1959).
Unclassified report

DESCRIPTORS: *Solids, Thermochemistry, USSR, Thermodynamics, Mechanical properties, Carbides, Temperature, *Metals, Mathematical analysis, Elasticity, Equations, *Metallic compounds, Melting, Thermal expansion, Borides, Salts.

Quantitative relationships are presented between the thermal features of solids such as the melting point, thermal coefficient of linear ex-

pansion, and heat-conductivity coefficient, and the solidity possibilities of solids under conditions of increased temperature, namely: (1) the relation between the modulus of normal elasticity and the thermal coefficient of linear expansion; (2) the relation between the Debye characteristic temperature of the solid and the modulus of its normal elasticity; (3) the Debye characteristic temperature and the melting point of a substance; (4) the relation between the melting point and coefficients of linear expansion of cubic and hexagonal metals, metallic compounds, and alkali-haloid salts; and (5) the relation between the characteristic temperature and the melting point for metals and chemical compounds with a metallic type of connection.

AD-257 688 Div. 25, 17
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
HYDROGEN AND FLAKES IN STEEL (SELECTED PART)
by D. Ya Povolotskiy and A. N. Morozov. 10 Jan 61, 16p. incl. tables (Trans. no. MCL-673 from Vodorod i Flokeny v Stali, Moscow:pp. 5-16, 1959)

Unclassified report

DESCRIPTORS: USSR, *Steel, *Hydrogen, Solubility, Iron, Phase transitions, Liquid metals, Lattices, Transition temperature, Diffusion, Iron alloys.

Studies were made to determine the solubility of H in Fe. It was found that the solubility of H is proportional to the square root of its pressure and that it rises with temperature. Alpha-Fe is transformed into gamma-Fe, and also at the melting point of delta-Fe, the solubility of H increases abruptly. When Fe is transformed from the gamma phase to the delta phase the solubility decreases somewhat. The effect of temperature and pressure on the solubility of H in liquid Fe was determined. For liquid Fe, the solubility of H is proportional to the square root of its pressure. Inclusions normally found in steel or admixtures used for alloying steel alter the phase-transformation temperature by expanding or contracting the gamma-Fe region. At room temperature the coefficient of H diffusion in the gamma-Fe lattice is almost 10,000 times less than in the alpha-Fe lattice. (Author)

AD-257 691 Div. 25, 14, 17
(14 June 61) OTS price $12.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THERMOPHYSICAL PROPERTIES OF MATERIALS (SELECTED PARTS),
by V. S. Chirkin. 14 Feb 61, 168p. incl. tables (Trans. no. MCL-705 from Teplofizicheskiye Svoystva Materialov, Spravochnoye Rukovodstvo, Moscow: pp. 6-10; 172-346, 1959)

Unclassified report

DESCRIPTORS: USSR, *Materials, Physical properties, Temperature, *Alloys, *Metals, Gases, Air, *Ceramic materials, *Handbooks, *Porous materials, Mechanical properties, Insulating materials, Concrete, Carbides, Thermal insulation, Graphite, Tables, Heat transfer, Thermodynamics.

Selected parts of a handbook are presented on the thermophysical properties of materials including metals and alloys, and porous and disperse materials (heat-insulating, structural ceramic, graphite, and carbides). Systematized data are given for metallic heat-transfer agents and the rare earth metals. Data are given primarily for temperatures above zero C, but some data are presented for lower temperatures.

AD-257 693 Div. 25, 20
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
LIQUID METAL RESEARCH IN THE INSTITUTE OF NUCLEAR RESEARCH IN 1956-58,
by M. Pasek. 13 Feb 61, 19p. incl. illus. (Trans. no. MCL-719 from Jaderna Energie V 11:373-377, 1959)

Unclassified report

DESCRIPTORS: *Liquid metals, Liquid metal pumps, Nuclear power plants, Radioactivity, Fluid flow, Viscosity, Circular coils, Heat exchangers, *Coolants, Electromagnetic pumps, *Heat transfer, Measurement, USSR.

Results of research work in liquid metals are analyzed. These results are focused mainly on tests of pumping and circulating of liquid metals in cooling systems, on studies of heat transfer, and on the measurements of flow and viscosity of liquid metals. (Author)

AD-257 697 Div. 25
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
HEAT EXCHANGE BETWEEN A LIQUID AND A HEAT-EMITTING ROD,
by V. I. Merkulov. 13 Feb 61, 10p. (Trans. no. MCL-727 from Dopovidi Akademii Nauk Ukrainskoy RSR 9:985-990, 1959)

Unclassified report

DESCRIPTORS: *Thermodynamics, *Heat transfer, Liquids, *Solids, Gases, Boundary layers, Surfaces, *Cylindrical bodies, *Fluids, USSR, *Heat exchangers, Partial differential equations, Mathematical analysis, Rods, Theory, Thermal radiation.

The paper gives a solution of the problem of stationary heat exchange between the plane stream of an ideal liquid and a heat-evolving cylinder. The temperatures in the rod and the liquid are represented by series obtained from functions which satisfy the equation. Unknown coefficients are determined from the equality of temperatures and heat flows on the rod boundary. (Author)

AD-257 710 Div. 25
(15 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON THE STABILITY OF SYMMETRICAL BIATOMIC MOLE-

CULES OF THE TRANSITION ELEMENTS,
by G. Verhaegen. 24 Feb 61, 9p. incl. illus.
(Trans. no. MCL-788 from De La Stabilite Des Molecules Biatomiques Symetriques Des Elements Transitoires: 8p. (1958))
Unclassified report

DESCRIPTORS: *Molecules, Stability, *Atomic energy levels, Electrons, Nuclear shell models, Molecular structure, Mass spectroscopy, *Dissociation, Atoms, Energy, Electron transistions.

Conditions are investigated which the symmetrical biatomic molecules of the transition elements can be observed. The determination of these conditions requires not only the estimation of the energies of dissociation which give physical stability but also of the free-energy function. (Author)

AD-257 713 Div. 25
(22 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MEASUREMENT OF THE RELATIVE IONIZATION CROSS SECTIONS OF Zn, Te AND Te2, AND OF THE DISSOCIATION ENERGY OF Te2 BY MASS SPECTROMETRY,
by R. Colin. 1961, 9p. incl. illus. (Trans. no. MCL-789 from Mesure Des Sections Efficaces D' Ionisation Relatives De Zn, Te Et Te2 Et De L'Energie De Dissociation De Te2 Par Spectrometric De Masse: 8p. 1958))
Unclassified report

DESCRIPTORS: *Tellurium, *Zinc, *Ionization, *Dissociation, Measurement, Mass spectroscopy, Thermodynamics, Vapors, Vaporization, Evaporation, *Tellurium compounds, *Zinc compounds, Theory, Isotopes, Belgium, Mass spectrometers.

AD-257 729 Div. 25, 14
(15 June 61) OTS price $3.60

Brown U., Providence, R. I.
THE ELASTIC WEDGE UNDER MIXED BOUNDARY CONDITIONS,
by J. Duffy. Apr 61, 25p. incl. illus.
(Grant no. DA-ORD-31-124-61-G4, Proj. TB2-0001)
(AROD rept. no. 2571:1) Unclassified report

DESCRIPTORS: *Wedges, Elasticity, *Stresses, Transformations (Mathematics), Coatings, Thickness, *Photoelastic materials, Deformation, Mathematical analysis.

Using the Mellin transform, the state of stress is found for the infinite elastic wedge with the following mixed boundary conditions: one edge is free of applied traction while along the other edge the displacement components are specified at each point. The solution is of interest in experimental stress analysis. (Author)

AD-257 730 Div. 25, 14, 17
(16 June 61) OTS price $7.60

Brown U., Providence, R. I.
EXPERIMENTAL STUDY OF PLASTIC FLOW UNDER STEPWISE INCREMENTS OF TENSION AND TORSION,
by Burton Paul, William Chen and Li-chih Lee.
May 61, 35p. incl. illus. tables (Technical rept. no. 22)
(Contract Nonr-56220, Proj. NR-064-424)
Unclassified report

DESCRIPTORS: *Plastic flow, Deformation, *Torque, *Stresses, Elasticity, Plasticity, Shear stresses, *Aluminum alloys, Tests, Oscillographs, Tables.

A detailed description of the experimental method and equipment of five tests of three aluminum alloy thin-walled specimens under combined tension-torsion is presented. Results of these tests are shown in various curves. No strong evidence can be found to disclose the existence of distinct corners. These results seem to imply that even if corners are present they have no significant influence on the plastic strain rate, for the material in question. Such a material is therefore not unduly sensitive to small fluctuations in load such as might occur in all but the most carefully controlled tests in the plastic range. (Author)

AD-257 743 Div. 25, 12
(15 June 61) OTS price $2.60

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
THE STUDY OF ELECTROMAGNETIC TECHNIQUES FOR SPACE NAVIGATION,
by R. G. Franklin, W. C. Reisener, Jr. and others.
Quarterly progress rept. no. 5, 16 Feb-15 May 61. 15 May 61, 26p. incl. illus. tables (Rept. no. Q-A2415-5)
(Contract AF 33(616)7244, Proj. 0(610)-4427)
Unclassified report

DESCRIPTORS: *Space navigation, Signal to noise ratio, *Light, Sources, *Mixer tubes, Radiometers, Instrumentation, Optical systems, Stars, Photoelectric cells, Doppler systems, Light transmission, *Celestial navigation, Electromagnetic waves, Microwave oscillators, Space navigation.

Equipment for the initial phases of the template spectroscopy work has been completely assembled and is being refined. A number of templates have been made using both the sun's spectrum and an iron arc source. Best results to-date have been obtained by matching the iron arc template against the iron lines in the sun's spectrum. Very good discrimination was obtained at the match point with a dc detection system, but changes in light level were a problem. The addition of a wobbulator to impart vibrating motion to the slit of the spectrograph now permits the use of ac detection. Results with the latter system have been very encouraging. A detection sensitivity of 10-15 m/sec has been achieved initially. For the optical heterodyning phase, the radiometer has been placed in operation and checked out satisfactorily. Mounts and motor drives for the optical components have been completed and a lamp holder cavity for the Hg source has been designed. Development of the TWT mixer has been delayed pending an investigation of the use of a cw laser as local oscillator. Analysis shows that the use of a laser would considerably ease the broad band requirement and made possible the use of standard photomultipliers in the mixing stage. (Author)

AD-257 764 Div. 25
(16 June 61) OTS price $2.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
MAGNETOHYDRODYNAMICS AND ENERGY CONVERSION.
Technical progress rept. no. 2 for period ending 28 Feb 61, 15 Mar 61, 21p. incl. illus. tables.
(Contract AF 33(616)7624)
Unclassified report

Included as section of Quarterly progress rept. no. 61, pp. 67-88, 15 Apr 61.

Division 25 - PHYSICS

DESCRIPTORS: *Magnetohydrodynamics, Energy, *Plasma physics, Magnetic fields, Electrostatic fields, Theory, *Electric fields, Mathematical analysis, Vector analysis, Cesium, Thermionic emission.

A comparison is made between two simple electrohydrodynamic and magnetohydrodynamic systems involving a surface interaction in plane geometry. The surface dynamics are formulated in terms of the surface traction of Korteweg and Helmholtz (Direct conversion of Heat to Electricity, M.I.T., 1960). Experimental results are given for the two electrohydrodynamic cases. (Author)

AD-257 771 Div. 25, 30
(15 June 61) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
PROPOSAL FOR MAGNETIC DOMAIN-WALL STORAGE AND LOGIC,
by D. O. Smith. 31 May 61, 15p. incl. illus. tables. (Rept. no. 53G-0059)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: Magnetism, *Ferromagnetism, Magnetic recording systems, *Metal films, Magnetic tape, Data storage systems, *Coding, Solids, *Solid state physics.

AD-257 793 Div. 25, 16
(16 June 61) OTS price $1.60

Naval Medical Research Inst., Bethesda, Md.
THE PROPERTIES OF THYROGLOBULIN. VI. THE INTERNAL RIGIDITY OF NATIVE AND DENATURED THYROGLOBULIN,
by R. F. Steiner and H. Edelhoch. Research rept., 4 Nov 60, vol. 18, pp. 577-594, incl. illus. tables, 22 refs. (Rept. no. 13)
(Proj. MR 005.06-0001.01; In cooperation with National Institutes of Health, Bethesda, Md.)
Unclassified report

DESCRIPTORS: Iodine, *Proteins, Chemical properties, Thyroid gland, *Polarization, Measurements, *Fluorescence, Physical properties, Detergents, Chemical reactions, Reagents, Mathematical analysis, Urea, Guanidine, Temperature.

The rotational relaxation time of native thyroglobulin has been evaluated from polarization measurements of thyroglobulin coupled to a fluorescent dye. By treatment with detergent or urea the relaxation time of thyroglobulin was markedly reduced. The original polarization was recovered on dilution out of either reagent. The disruption of the internal structure produced by detergent was evident by the ability of sulfhydryl reagents to further decrease the relaxation time whereas they are without effect in the absence of detergent. Similarly a time-dependent decrease in polarization was evident in alkali when 8M urea or 5M guanidine was present. In the absence of the latter reagent only a relatively small change in relaxation time occurred in alkali. The changes in polarization have been compared with hydrodynamic methods acertaining configurational modifications. It is apparent that polarization measurements can provide additional insight into the degree of disorganization of the internal structure of a protein molecule. (Author)

AD-257 796 Div. 25
(15 June 61) OTS price $5.60

Nuclear Corp. of America, Denville, N. J.
UNIJUNCTION DEVICES MADE FROM RARE EARTH SEMICONDUCTORS,
by Nathan Sclar. Quarterly rept. no. 1, 1 Jan-31 Mar 61. 31 Mar 61, 36p. incl. illus. 22 refs.
(Contract DA 36-039-sc-87392, Proj. 3A99021-001)
Unclassified report

DESCRIPTORS: *Rare earth compounds, *Nitrides, *Borides, *Semiconductors, Electrons, Atomic structure, Chemical bonds, Intermetallic compounds, Phosphides, Crystals, *Crystal structure, Single crystals, Thin films, Solid state physics, Optics, Wave transmission, Absorption, Energy, Light transmission, Electrical properties, Synthesis, Theory, Rare earth elements.

A theoretical analysis is presented which indicates that rare earth compounds formed by combining rare earth metals with elements from the fifth column of the periodic table result in rare earth semiconductors. The energy gaps of these rare earth semiconductors are estimated by a semiempirical approach in which the ionic and covalent atomic radii of the rare earth compounds are compared with the group III and group V atoms which are known to give compound semiconductors. It is concluded that the rare earth nitrides will be semiconductors. Analysis on the electron mobility to be expected in these semiconductors is also presented. Another class of rare earth semiconductor discussed are the rare earth borides. Preliminary experimental optical transmission data obtained on selected rare earth nitrides and borides in the thin film form is presented. Energy gap values are estimated from the wavelength position of the edge; these lie in the range 2 to 3 ev. (Author)

AD-257 815 Div. 25, 15
(15 June 61) OTS price $2.60

Rand Corp., Santa Monica, Calif.
ON THE DIFFUSION MATRIX OF RADIATIVE TRANSFER,
by Sueo Ueno. 9 Mar 61, 19p. 37 refs. (Rept. no. RM-2744)
(Contract SD-79)
(ARPA Order no. 189-61) Unclassified report

DESCRIPTORS: Reflection, *Transmission, *Diffusion, *Electromagnetic waves, Atmosphere, *Optics, Operators (Mathematics), Scattering, Matrix algebra, *Integral equations, *Quantum statistics.

The diffusion matrix, formerly derived with the stochastic model of radiative transfer, is derived using auxiliary equations in conjunction with the Milne integral equations. Also derived is the extension concerning the Neumann solution as given by Busbridge. In the case of diffuse reflection and transmission of parallel rays, the solutions are expressed in terms of a pair of scattering and transmission functions for each of the two boundaries of the atmosphere. Then these global functions are given by X and Y functions that are equal to those previously found by Bellman and Kalaba. Whereas the diffusion matrix formally has a somewhat similar appearance to a map yielded by Preisendorfer, the mathematical development is different. If the optical properties of the medium are constant throughout the atmosphere, the reflectance and transmittance operators reduce to those given by Sobolev.

AD-257 818 Div. 25, 1, 12, 15
(16 June 61) OTS price $.75

Southampton U. (Gt. Brit.).
ON INFLUENCE FUNCTIONS IN THE THEORY OF FORCED VIBRATIONS OF MEMBRANES,
by I. Torbe and D. I. G. Jones. Mar 61, 19p. incl. illus.
(Contract AF 61(052)332, Proj. 7351)
(WADD TR 61-97) Unclassified report

DESCRIPTORS: *Membranes, *Integral equations, *Vibration, Vibration mechanisms, Sheets, Metal plates, Mechanics, Dynamics, Load distribution, *Damping, Airplane panels, Airframes.

A general method is outlined for the calculation of the response of membranes with arbitrary boundaries to arbitrary loadings. It is assumed that, by projecting the area of the given membrane on the surface of an unbounded membrane and then applying the given loading to this projection, the application of a suitable load distribution around the boundary of the projection will enable us to satisfy the boundary conditions appropriate to the given membrane. An attempt to find the distribution in question leads to a logarithmically singular integral equation of an unusual type. A few solutions are outlined. (Author)

AD-257 822 Div. 25, 8
(16 June 61) OTS price $5.60

Syracuse U. Research Inst., N. Y.
TIME RESPONSE CHARACTERISTICS OF LINEAR NETWORKS AND TRANSFORMATION METHODS IN NETWORK SYNTHESIS,
by John D. Brule and B. P. Shah. Final rept., pt. 2. 30 May 61, 51p. incl. illus. tables, 13 refs. (Rept. no. EE745-615F2)
(Contract AF 19(604)6142)
(AFCRL-186, vol. 2) Unclassified report

DESCRIPTORS: Synthesis, *Electrical networks, Mathematical analysis, *Operational calculus, Digital computers, Partial differential equations, Differential equations, Least squares method, Vector analysis, Functions, Programming, Transients, Taylor's series.

An attempt has been made to use the criterion of least-squared error to determine analytically the shifts of the locations of the poles and residues of a transfer function in order to meet a time domain specification. A first approximation is obtained with the help of existing methods, and successive steps are carried out using the first two terms of the Taylor Series expansion of the first approximation. In the process, orthogonal vector functions are formed by linear combinations of the partial derivative functions. The use of FORTRAN for programming the problem for the IBM 650 data processing machine is illustrated. (Author)

AD-257 864 Div. 25, 8, 20
(20 June 61) OTS price $3.00

Georgia Inst. of Tech., Engineering Experiment Station, Atlanta, Ga.
RESEARCH ON VARIOUS PHENOMENA FOR THE PERFORMANCE OF CIRCUIT FUNCTIONS,
by Edwin J. Scheibner and Arthur L. Bennett. Rept. for 1 July 58-30 Sep 59. Oct 59, 174p. incl. illus. 240 refs.
(Contract AF 33(616)6028, Proj. 4150)
(WADC TR 59-737) Unclassified report

DESCRIPTORS: Physics, *Solid state physics, Scientific research, Electronics, *Subminiature electronic equipment, *Dictionaries, *Electromagnetic theory, Semiconductors, *Circuits.

An investigation of various solid-state phenomena and effects which might have an application in electronic systems was made. Technical articles on fifty-two phenomena and effects are presented in this report. Each article includes a definition, a detailed description, and a short bibliography. Eighteen other related effects are covered. (Author)

AD-257 880 Div. 25, 2
(21 June 61) OTS price $1.10

Geophysics Corp. of America, Boston, Mass.
PHOTOIONIZATION OF ATOMIC OXYGEN AND NITROGEN,
by Alexander Dalgarno. Dec 60, 8p. incl. tables.
(GCA Technical rept. no. 60-5-N)
(Contract NASw-124)
Unclassified report

DESCRIPTORS: *Oxygen, *Nitrogen, *Ionization, Photochemistry, *Atoms, Electrons, Excitation, Atomic energy levels, *Atomic spectrum, Upper atmosphere, *Ionosphere, Atmosphere, Photochemical reactions, Gas ionization.

A knowledge of the photoionization cross sections of atomic oxygen and atomic nitrogen from the spectral heads down to the X-ray region is necessary for the interpretation of the behavior of the ionized layers. Available theoretical and experimental data were examined and sets of recommended values were obtained. (Author)

AD-257 881 Div. 25, 20
(21 June 61) OTS price $1.60

Carnegie Inst. of Tech., Pittsburgh, Pa.
NUCLEAR SIZE AND QUADRUPOLE EFFECTS IN MOSSBAUER ABSORPTION,
by S. DeBenedetti. 21 Apr 61, 8p. illus. table
(Technical rept. no. 1)
(Contract Nonr-76020, Proj. NR 017-736)
Unclassified report

Presented at the 1961 Spring Meeting of the American Physical Society, Washington, D. C.

DESCRIPTORS: *Resonance absorption, Magnetism, Magnetic fields, *Ferromagetism, Crystals, *Paramagnetic salts, Paramagnetic crystals, *Iron compounds, Iron alloys, Quadrupole moments, Nuclear physics, Nuclear spins, Nuclear states.

The observation of resonance absorption of the 14 KeV line of Fe-57 through the Mossbauer effect gives a significant contribution to the understanding of the atomic properties of ferromagnetic iron and of paramagnetic iron salts. Certain aspects of the nuclear quadrupolar interaction in the ions of iron are discussed. Topics include the properties of the 14 KeV Fe-57 nuclear transition, properties of atoms in crystals, and experimental results. (Author)

AD-257 892 Div. 25, 12
(21 June 61) OTS price $3.60

Space Research Labs., Litton Industries, Beverly Hills, Calif.
FOURTH AFOSR CONTRACTORS' MEETING ON ION AND PLASMA ACCELERATION, BEVERLY HILLS, CALIFORNIA -

Division 25 - PHYSICS

APRIL 20-21, 1961. SUMMARY OF ABSTRACTS.
1961, 30p. (Publication no. 1600)
(Contract AF 49(638)759)
(AFOSR-582) Unclassified report

DESCRIPTORS: Ions, *Plasma physics, *Plasma jets, Acceleration, *Bibliography, *Symposia, Electromagnetic effects, Wires, Detonation, Explosions, Shock waves, Magnetic fields, Ionization, Jet propulsion, Rocket propulsion, *Propulsion, Ion rokets.

Abstracts are presented which, taken together, briefly describe the current status of research efforts contractually supported by AFOSR and other research programs in the field of ion and plasma acceleration. (Author)

AD-257 893 Div. 25
(21 June 61) OTS price $.50

Naval Research Lab., Washington, D. C.
A HIGH RESOLUTION INVESTIGATION OF THE RELATIVE SPECTRAL ATTENUATION COEFFICIENTS OF WATER. PART 1. PRELIMINARY,
by L. F. Drummeter and G. L. Knestrick. Interim rept. 24 May 61, 7p. incl. illus. tables (NRL rept. no. 5642)
Unclassified report

DESCRIPTORS: Spectrographic analysis, *Water, Attenuation, Light, Brightness, Optical spectrometers, *Light transmission, *Optics, *Wave characteristics.

The variation with wavelength of the attenuation coefficient of battery-grade distilled water was studied with a grating spectrograph over the range from 3750 A to 6850 A, in an attempt to discern any narrow wavelength fluctuations in the coefficient. With a 0.2 Angstrom resolution and a water path of 32 ft, the detection limit corresponded to about 0.00002/cm variation of the attenuation coefficient and no fine structure was detectable. (Author)

AD-257 897 Div. 25, 8
(21 June 61) OTS price $8.10

General Mills, Inc., Minneapolis, Minn.
INVESTIGATIONS OF BISMUTH-TELLURIUM-SULFUR COMPOUNDS,
by H. H. Soonpaa and R. K. Mueller. Final rept. 15 May 61, 1v. incl. illus. tables, 27 refs.
(Rept. no. 2195)
(Contract Nonr-158914, Proj. 85038)
Unclassified report

DESCRIPTORS: *Bismuth compounds, *Tellurium compounds, *Sulfides, Crystals, Crystal structure, Lattices, Electrical properties, Electrical conductance, Light transmission, Refractive index, *Semiconductors, Thermoelectricity, Heat transfer, *Single crystals, Preparation, Growth, Infrared spectroscopy, Absorption, Energy, Electric currents, Measurement, *Tellurides, Intermetallic compounds, *Solid state physics.

A new semiconducting crystalline compound Bi8Te7S5, or gemilide, was prepared. The material is characterized by rhombohedral R3m symmetry, a large unit cell (a is 8.3935 angstroms and c is 58.904 angstroms by hexagonal notation). It cleaves readily along the base plane (perpendicular to the c-axis) to yield mirror-like surfaces. The purity of the material is adequate to allow optical transmission measurements. The index of refraction in the infrared is around 7, decreasing linearly with the wavelength. Electrical and optical measurements on Bi8Te7S5 are reported. Different measuring techniques have been described in detail. The Lorenz number is found to be low for this material. With an improved Seebeck coefficient gemilide might be a good thermoelectric material. (Author)

AD-257 912 Div. 25, 2, 8
(22 June 61) OTS price $1.60

Science and Tech. Section, Air Information Div. Washington, D. C.
ION CLOUDS AND PLASMA PHENOMENA.
Background rept. for Jan 58-Jan 60. 19 May 61, 10p. 16 refs. (AID rept. 61-68)
Unclassified report

DESCRIPTORS: Ions, *Ionosphere, *Plasma physics, Electrons, Density, Interferometer, Microwaves, *Electromagnetic waves, *Magnetohydrodynamics, Sounding rockets, Propagation, *Radio waves, Satellite vehicles, *Upper atmosphere, Absorption, Resonance, USSR.

AD-257 929 Div. 25
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
SOLID-STATE LASER RESEARCH.
6 June 61, 5p. (AID rept. 61-89, Trans. from Generation of Coherent Light By Means of Solids; Akademiya Nauk SSSR. Vestnik 3:61-66, Mar 61)
Unclassified report

DESCRIPTORS: *Light, Amplifiers, *Optical equipment, USSR, Technological intelligence, *Luminescence, *Infrared equipment, Infrared radiation, *Semiconductors, Ruby, Fluorides, Calcium compounds, Electron transitions, Oscillators.

AD-257 932 Div. 25, 6
(21 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div. Washington, D. C.
SHOCK WAVES AS RELATED TO DETECTION AND TRACKING.
Background rept. for Jan 58-Jan 60. 19 May 61, 7p. 11 refs. (AID rept. 61-77).
Unclassified report

DESCRIPTORS: Bibliography, *Shock waves, Aerodynamics, *Supersonics, *Detection, *Tracking, Satellite vehicles, Electric discharges, Electrical corona, Plasma physics, Magnetohydrodynamics, Meteors, Radar, *Ionosphere, Electric fields, Electrons, Gas ionization, Atmosphere, Penetration, Magnetic fields, Cosmic rays, USSR.

Contents: (annotations of Journal articles): Fialko, Ye. I. Astronomicheskiy zhurnal, 36:491-495 and 35:881-887, 1959. Gershaman, B. N. and Kovner, M. S. Izvestiya vysshikh uchebnykh avedeniy. Radiofizkika, 2:28-36, 1959. Kononenko, K. I. Ibid, 1:167-169, 1958. Gurevick, A. V. Ibid, 2:255-369, 1959. Kiselev, M. I. and Tseplyayev, V. I. Zhurnal eksperimental 'noy i teoreticheskoy fiziki, 34:1605-1609, 1958. Pikel'ner, S. B. Ibid, 36:1536, 1959. Stepanov, K. N. Ibid, 34-1292-1301, 1958. Akademiya nauk SSSR. Izvestiya, Seriya geofizicheskaya, 8:1164-1165, 1959. Sitenko, A. G. and Kirochkin, Yu.A. Zhurnal tekhnicheskoy fiziki, 29:801-807, 1959. Mirtov, B. A. Iskusstvennyye sputniki zemli, 2:17-25, 1958.

AD-257 934 Div. 25, 8
(19 June 61) OTS price $10.10

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
NETWORK THEORY OF SEMICONDUCTOR HALL PLATE CIRCUITS,
by Jag Mohan Garg. June 61, 108p. incl. illus. tables, 32 refs. (Research rept. no. PIBMRI-868-60)
(Contract AF 18(603)105)
(AFOSR-693) Unclassified report

DESCRIPTORS: *Hall effect, *Semiconductors, Conductivity, Mathematical analysis, Theory, *Electrical networks, Synthesis, Tests, *Solid state physics, Algebra, Matrix algebra, Magneto-optic rotation, Circuits.

Investigation was concerned with the study of properties and synthesis of passive electrical networks which contain Hall plates as nonreciprocal elements. Network representations of these elements which are dissipative and linear and exhibit nonreciprocity, and the optimum performance of these elements when used in a suitable connection with other conventional network elements are the major topics of interest. (Author)

AD-257 966 Div. 25, 13
(19 June 61) OTS price $6.60

Bolt, Beranek, and Newman, Cambridge, Mass.
COMPENDIUM OF IMPEDANCE FORMULAS,
by Manfred A. Heckl. 26 May 61, 49p. incl. illus. (Rept. no. 774)
(Contract Nonr-232200, Proj. NR 264-017)
Unclassified report

DESCRIPTORS: *Mechanics, *Mechanical engineering, Vibration, *Vibration mechanisms, Beams, Metal plates, Sheets, Equations, Differential equations, Impedance.

A list of impedance formulas is presented which can be applied to the vibration excitation of simple structures such as beams, plates, rings, and beam-plate systems. Infinite, semi-infinite, and finite systems are considered. Most of the formulas have been taken from the existing literature; others are derived. Short derivations are given in the Appendixes. (Author)

AD-257 968 Div. 25, 8
(20 June 61) OTS price $1.60

Barus Research Lab. of Physics, Brown U., Providence, R. I.
STUDY OF SURFACE PROPERTIES OF ATOMICALLY-CLEAN METALS AND SEMICONDUCTORS,
by H. E. Farnsworth, D. Shooter, and J. Marsh. Quarterly progress rept. no. 9, 1 Feb-30 Apr 61. May 61, 14p. incl. illus. tables, 11 refs.
(Contract DA 36-039-sc-78286, Proj. 3-99-15-110)
Unclassified report

DESCRIPTORS: *Metals, *Semiconductors, *Surface properties, Surfaces, *Diamonds, Crystals, Electron diffraction analysis, Catalysts, *Germanium, Contamination, Metallic crystals, Heating, Heat treatment, Ion bombardment, Nickel.

EXAMINATION OF THE (111) SURFACE OF A DIAMOND CRYSTAL BY MEANS OF LOW-ENERGY ELECTRON DIFFRACTION: A diamond crystal was cut with one face parallel to a (111) crystallographic plane. Before placing it in the vacuum tube, the surface was abraded with a fine grinding compound. Diffraction patterns have been observed in all 3 major azimuths with no heating subsequent to the 300 degrees baking used in the evacuation process, and fairly extensive data have been taken in both the (112) and (110b) azimuths. Observations that the diffraction pattern intensity decreases with time after the incident electron beam is turned on indicate that the crystal is charging up. INVESTIGATION OF THE CATALYTIC PROPERTIES OF Ge: From absorption and activity measurements on a W filament, further evidence has accumulated that the lack of activity of the Ge crystal was not due to contamination. An Ni polycrystal was introduced in place of Ge and its activity successfully measured. The activity of the Ni under varying conditions of pressure, contamination and surface treatment was obtained. (Author)

AD-257 994 Div. 25
(19 June 61) OTS price $2.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
BALANCED FILTERS FOR X-RAY DIFFRACTOMETRY,
by R. A. Young. 15 June 61, 18p. incl. illus. (Technical rept. no. 1)
(Contracts Nonr-99100 and Nonr-99106)
Unclassified report

DESCRIPTORS: *X-ray filters, *X-ray diffraction analysis, Diffraction, Materials, Pulse height analyzers, Test equipment, Crystals, X-ray spectroscopy, X-rays, *Band-pass filters, *Crystal filters, Single crystals.

The theoretical basis and the experimental specifics are presented for a generally valid, systematic procedure which achieves simultaneous balance of x-ray filter pairs over a wide range of wavelengths. Kirkpatrick's (Rev. Sci. Inst., 15:223(1944)) third material is necessarily employed. Corollary topics discussed include the preparation of filters and holders, criteria for balance, methods of testing for balance, and the role of pulse height analysis in the balanced filter technique. It is shown how a number of points of possible experimental difficulty may be recognized and overcome. Results obtained by following the described procedure are presented. (Author)

AD-258 023 Div. 25
(20 June 61) OTS price $3.60

Case Inst. of Tech., Cleveland, Ohio.
EXPERIMENTAL EVALUATION OF PULSE ECHO TECHNIQUE,
by J. A. Corll. Technical rept. no. 5 on Solid State Physics Program. Feb 61, 29p. incl. illus. tables (Technical rept. no. 5)
(Contract Nonr-114105, Proj. NR 017-309)
Unclassified report

DESCRIPTORS: Solid state physics, Electromagnetic waves, Propagation, *Single crystals, Silver, Measurement, Pressure, Elasticity, *Ultrasonics, Temperature, *Transducers, *Acoustics, Acoustic impedance, Quartz crystals, Sound transmission, Reflection.

A systematic experimental evaluation of the ultrasonic pulse echo technique for the determination of elastic constants and pressure derivatives was made by inter-comparing the directly measured values of these 2 quantities which are associated with wave propagation in 3 directions The measurements were made on 3 single crystals of silver with 10 mc ultrasonic gear and a pressure range to 9,500 atmospheres. Comparison of

the measured values of the elastic constants yielded a maximum discrepancy of 0.3%. A similar comparison of the measured values of the pressure derivatives yielded a maximum discrepancy of 3.5%. (Author)

AD-258 038 Div. 25
(22 June 61) OTS price $1.10

Hebrew U. (Israel).
RESEARCH ON DOUBLE X-RAY REFLECTIONS OF SINGLE CRYSTALS,
by B. S. Fraenkel. Technical rept. (Final), 19 Mar 61, 4p.
(Contract AF 61(052)222)
(AFOSR-658) Unclassified report

DESCRIPTORS: *Single crystals, *Reflection, *X rays, Intensity, Determination, Polarization, Mathematical analysis, Lattices.

Intensities of double (simultaneous) Bragg reflections have been calculated, by calculating Lorenz and polarization factors for small perfect crystals. A method of indexing double reflections has been developed. Comparison with experiment shows that the relative intensities of the double reflections agree fairly well with the calculated intensities. A method has been developed to get double reflections whose sum of indices is an allowed reflection. (Author)

AD-258 039 Div. 25, 4, 15
(22 June 61) OTS price $8.60

Sloane Physics Lab., Yale U., New Haven, Conn.
PROPERTIES OF THE THIRTY-TWO POINT GROUPS,
by J. O. Dimmock and R. G. Wheeler. 27 May 61, 86p. incl. illus. tables, 24 refs.
(Contract AF 49(638)503)
(AFOSR-830) Unclassified report

DESCRIPTORS: Solids, *Solid state physics, Crystals, *Stereochemistry, Lattices, Mathematics, Tables, Quantum mechanics, Groups (Mathematics), Topology.

The 32 single and double point group character tables are given along with the complete compatibility tables and representation multiplication tables. A scheme for the multiplication of barred and unbarred operators obtained by Bethe (Ann. Phys. Lpz. 3:133, 1929) is presented in detail. Also the transformation properties and external field reductions are given for each group. The time reversal properties for the point group representations are indicated. (Author)

AD-258 080 Div. 25
(22 June 61) OTS price $1.60

Vienna U. (Austria).
A ONE DIMENSIONAL FIELD THEORY WITH DEGENERATE VACUUM,
by K. Baumann and R. Sexl. 20 Jan 61, 14p.
(Scientific note no. 7)
(Contract AF 61(052)265)
(AFOSR-808) Unclassified report

DESCRIPTORS: *Relativity theory, Quantum mechanics, Particles, *Operators (Mathematics), Electromagnetic fields, Energy, Functions, *Quantum statistics, Transformations (Mathematics), Theory, Ferromagnetism, Electromagnetic theory.

A one dimensional field theory is considered corresponding to the continuous limit of a spin chain. The vacuum degeneracy of this theory is explored. Besides, it is shown that the theory can equivalently be formulated in terms of an interacting Fermi field or of a Bose field without interaction. Finally, a theory is discussed briefly which can either be treated as an interacting Bose field or as a free Fermi field. (Author)

AD-258 081 Div. 25
(22 June 61) OTS price $2.60

Vienna U. (Austria).
ON FIELD THEORIES WITH DEGENERATE GROUND STATES,
by K. Baumann, G. Eder, and R. Sexl. 20 Apr 61. 21p. (Scientific note no. 8)
(Contract AF 61(052)265)
(AFOSR-853) Unclassified report

DESCRIPTORS: *Superconductivity, *Relativity theory, *Operators (Mathematics), Transformations (Mathematics), Energy, Electromagnetic fields, Electromagnetic theory, Theory, *Quantum statistics, Matrix algebra, Integral equations, Particles.

A model field theory of the superconducting type is solved exactly. The exact solution is compared with the Bardeen-Cooper-Schrieffer solution. The exact ground state is non-degenerate while the Bardeen-Cooper-Schrieffer ground state is degenerate. The connection between the two types of ground states, and between their energies, is given. Also some properties of the excited states are discussed. (Author)

AD-258 087 Div. 25, 8
(20 June 61) OTS price $3.60

Little, Arthur D., Inc., Cambridge, Mass.
FREQUENCY MIXING WITH SUPERCONDUCTING ELEMENTS,
by Sidney Shapiro. Final rept. Mar 61, 39p. incl. illus. 61 refs.
(Contract AF 19(604)5889)
(AFCRL-75) Unclassified report

DESCRIPTORS: *Superconductors, *Superconductivity, Electromagnetic waves, Microwave frequency, Detection, *Phase transitions, Partial differential equations, Mathematical analysis, Theory, Magnetic fields, Impedance.

The problem of frequency mixing using superconducting elements is examined from two points of view. One involves the non-linear effects associated with the superconducting-normal phase transition. The other treats the electrodynamics of superconductors with particular attention a possible non-linear effects associated with a body maintained within the superconducting state. The details of an experimental program designed to investigate the latter effects are given. Discussion of recent developments, especially in the observation of tunneling between superconductors, indicates the directions in which the aims of this study might be further pursued. (Author)

AD-258 090 Div. 25, 8
(23 June 61) OTS price $10.10

Northrop Aircraft, Inc., Hawthorne, Calif.
STUDY OF GENERATION OF COHERENT ELECTROMAGNETIC

RADIATION BY A PULSATING PLASMA,
by R. W. Sampson, R. A. Kinney, and K. H. Kriz. Rept. for 20 July 60-20 Feb 61, 117p. incl. illus. tables, 44 refs. (Rept. no. NOR-61-26) (Contract AF 30(602)2354, Proj. 5561) (RADC TR 61-77) Unclassified report

DESCRIPTORS: *Plasma physics, Oscillators, *Radiofrequency oscillations, Microwave oscillators, *Electromanetic waves, *Propagation, Magnetohydrodynamics, Magnetic pinch, Traveling wave tubes, Vibration, Dipole moments.

Potential means by which a plasma may function as a coherent source of electromagnetic radiation at RF or UHF are investigated. The ultimate purpose is to indicate the possibility of developing a coherent, plasma source of radiation having the necessary power output for radiation weapon applications. The second objective of this study is to outline the necessary experimental work which would be pursued to demonstrate physically the existence, magnitude, and mode of coherent radiation from a plasma. (Author)

AD-258 093 Div. 25, 8
(23 June 61) OTS price $7.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
GALVANOMAGNETIC PROPERTIES OF CARRIERS ASSOCIATED WITH THE CLEANED GERMANIUM SURFACE,
by Rolland A. Missman, Jr. 1 Dec 60, 69p. incl. illus. table (Technical note no. 2) (Contract Nonr-183417, Proj. NR 372-101) Unclassified report

DESCRIPTORS: *Germanium, *Semiconductors, Crystals, Crystal structure, Atomic energy levels, Atomic orbitals, Electrostatics, Surface properties, *Hall effect, Electric fields, Electrical conductance, Conductivity, Electrons, Energy, Electrical properties, Physical properties, Lattices, Solid state physics.

The galvanometric properties of the carriers associated with the clean Ge surface were measured. The carriers associated with the (100) surface have a p-type Hall contribution from 90 to 300 K. The mobility of these carriers ranges between 500 and 1200 sq cm/volt-sec and for a given specimen is constant over this temperature range. The number of these carriers is about 10 to the 12th power/sq cm and is essentially constant with temperature indicating that they are degenerate. There is no evidence for the presence of n-type carriers but their presence cannot be definitely ruled out. If they are present on the (100) surface their mobility is much smaller than that of the holes. The energy bands appear to be bent upward such that the valence band crosses the Fermi level at the surface. The bending is caused by the presence of relatively immobile electrons distributed randomly over the surface with a density of one per 1000 surface atoms. The same number of holes moves near the surface in the Coulomb fields of these electrons and gives most of the surface conductance. One specimen having a (111) surface was measured and the results showed that there may be both positive and negative carriers with high mobilities present at the surface. (Author)

AD-258 111 Div. 25, 9, 10, 27
(19 June 61) OTS price $1.60

Politechnico d Torino (Italy).
SIMULTANEOUS TRANSFER OF MOMENTUM, HEAT AND MASS. PART II. GAS-VAPOUR MIXTURES,
by Gianni Jarre. Feb 61. 15p. incl. illus. (Technical note no. 19) (Contract AF 61(052)208) (AFOSR-16) Unclassified report

DESCRIPTORS: *Laminar boundary layer, *Gas flow, Fluid flow, *Turbulent boundary layer, Thermodynamics, Heat transfer, Turbulent flow, Gases, Moisture, Condensation, Evaporation, Vapors, Velocity, *Fluid mechanics, Transport properties, Temperature, Mathematical analysis, Theory, Mixtures.

Study was made of the analogy between the velocity, temperature and concentration fields and the analogy between the momentum, heat and mass transfers, is high speed streams of moist gases over surface where evaporation or condensation can occur. The deduced transfer analogy is an extension of the classical Colburn analogy (Ind. Eng. Chem., 22:967, 1930). The following factors were considered: (1) high speed, (2) high vapor concentration, (3) different gas and vapor specific heats, and (4) full range of flow regimes from the laminar Couette flow to the fully turbulent boundary layer flow. (Author)

AD-258 132 Div. 25
(19 June 61) OTS price $1.60

Ohio State U. Research Foundation, Columbus.
LOW-TEMPERATURE SPONTANEOUS TRANSFORMATIONS IN FINE-GRAINED ALKALI METALS,
by K. D. Alexopoulos and C. H. Shaw. Feb 61, 12p. incl. illus. (Technical rept. no. 3) (Contract Nonr-49516, Proj. NR 017-606/2-25-60) Unclassified report

DESCRIPTORS: *Crystal structure, *Alkali metals, *Transformations, Potassium, Sodium, Lithium, Crystals, Low temperature research, Grains (Metallurgy), X-ray diffraction analysis, Cryogenics.

In the course of diffraction experiments on lithium, sodium, and potassium cooled to 1.4 K, observations were made on the quantity of transformed phase and the temperture region in which this transformation occurs. Two samples of lithium were used. The first was of very pure metal of rather large grain size; the second was less pure, but fine-grained. Both samples showed spontaneous transformation to hcp (hexagonal close-packed) and fcc. The behavior of a fine-grained sodium sample in the same temperature range was quite different. Upon the first cooling to 1.4 K, no low-temperature phase appeared. After being warmed to 77 K and again cooled, the hcp phase appeared in considerable quantity. No spontaneous transformation was detected in a fine-grained sample of potassium to 1.4 K. (Author)

AD-258 133 Div. 25, 17
(19 June 61) OTS price $1.10

Ohio State U. Research Foundation, Columbus.
X-RAY INVESTIGATION OF THE CHARACTERISTIC TEMPERATURE OF TUNGSTEN,
by K. D. Alexopoulos and C. H. Shaw. Feb 61, 8p. incl. illus. 10 refs. (Technical rept. no. 4) (Contract Nonr-49516, Proj. NR 017-606/2-25-60) Unclassified report

Division 25 - PHYSICS

DESCRIPTORS: *Tungsten, *Specific heat, Lattices, Vibration, X-ray diffraction analysis, Thermodynamics, Tungsten wire, Temperature, Intensity, X-rays, Measurement, Determination.

The ratio of the intensity of the powder diffraction line (116-235) to that of the line (011) for a W wire has been determined for Mo K alpha radiation (0.71A) for temperatures 1.4, 17, 44, 145, and 294 K. X-ray intensities were measured with a proportional counter. Previous specific heat measurements by Horowitz and Daunt (Phys. Rev. 91:1099, 1953) gave a peak at 17 K in the curve of the Debye characteristic temperature as absolute temperature T, whereas more recent measurements show no such maximum. The results of Horowitz and Daunt indicated an expected increase in the x-ray scattering ratio of some 4% between 1.4 and 17 K. Accuracy of measurement of the scattered x-ray intensities was adequate for purposes of comparison, and the x-ray results lend support to the specific heat measurements of Horowitz and Daunt. The remainder of the characteristic temperature curve to 294 K is discussed. (Author)

AD-258 144 Div. 25, 8
(21 June 61) OTS price $10.50

Naval Research Lab., Washington D. C.
ELECTRICALLY EXPLODED WIRES. EXPERIMENTS AND THEORY,
by J. B. Langworthy, R. C. O'Rourke and others.
Progress rept. for 1 March 58 to 30 June 60, 5 May 61, 1v. incl. illus. tables (NRL rept. no. 5489)
Unclassified report

DESCRIPTORS: *Plasma physics, *Wire, Shock tubes, *Detonation, Bremsstrahlung, Electric discharges, *Magnetohydrodynamics, Partial differential equations, Explosions, Spectrographic analysis, Differential equations, Electrical conductance, Conductivity, Tests, Capacitors, Hydrodynamics.

Progress relating to the following topics is summarized: Pertinent design details of the NRL high-temperature laboratory. The design, construction, and operation of the three capacitor systems currently being employed in the program on exploding wires which will be referred to as Mylar capacitor, the Mylar-water capacitor, and the water capacitor. The theoretical program which is being carried out in conjunction with the experimental program. In particular, an elementary theory of the processes which might occur in an exploding wire is given and, where possible, numerical examples are presented which can be applied to experiments. The electronic instrumentation program which includes traveling-wave scope techniques for measuring current and power in exploding wires with 10 to the minus 9th power sec resolution. The optical instrumentation problem which involves the N1C streak camera, the Model 102 ultra-high-speed streak spectrograph, and the N9GS grating streak spectrograph which has high spectral resolution. Included with the descriptions of the experimental apparatus are some preliminary experimental results. (Author)

AD-258 147 Div. 25
(19 June 61) OTS price $4.60

Stanford Research Inst., Menlo Park, Calif.
MEASUREMENT OF CHARGE-TRANSFER CROSS SECTIONS,
by O. Heinz. Final rept. 1 May 59-30 Apr 61. 26 May 61, 1v. incl. illus. tables, 11 refs.
(Contract DA 04-200-ORD-962, Proj. TN 2-1242)
(AROD rept. no. C-4.2) Unclassified report

DESCRIPTORS: Measurement, *Electron transitions, *Atoms, *Molecules, *Electron charge, Particles, Nitrogen, Argon, Ions, *Ion beams, Ion bombardment, Gases, Secondary emission, Ionization.

Research was conducted in the area of atomic collision phenomena. Studies were made of various aspects of atomic and molecular charge-transfer processes. Measurements of the relative efficiency of various gases in converting fast beams of N(+) and N2(+) into N and N2 neutral beams, respectively, were carried out. Measurements of the charge transfer cross sections for the reactions N(+) + Ar yields N + Ar(+), N2(+) + Ar yields N2 + Ar(+), and Ar(+) + Ar yields Ar + A(+) are being made. A preliminary study of experimental methods for detection of excited (particularly metastable) ions and atoms in beams was undertaken. (Author)

AD-258 198 Div. 25, 20
(26 June 61) OTS price $2.60

Sloane Physics Lab., Yale U., New Haven, Conn.
EXCITON STRUCTURE AND ZEEMAN EFFECTS IN CADMIUM SELENIDE.
by J. O. Dimmock and R. G. Wheeler. 12 June 61, 19p. illus.
(Contract AF 49(638)503)
(AFOSR-829) Unclassified report

DESCRIPTORS: *Intermetallic compounds, *Selenium alloys, *Cadmium alloys, Magnetic fields, Spectrographic analysis, Nuclear energy levels, Semiconductors, *Magneto-optic rotation, Crystals, *Excitation, *Selenides, Cadmium compounds.

Observations were made of the exciton spectra in wurtzite cadmium selenide. The identification and subsequent interpretation was facilitated by measurements of the magneto-optical effects of the spectra. A qualitative understanding of the spectra is obtained from a review of the allowed band symmetries at K equals 0,0,0 in crystals of C subscript 6V superscript 4 symmetry. The exciton symmetries and selection rules are obtained group theoretically. A quantitative comparison with an anistropic exciton mass theory, which will be outlined, permits evaluation of the electron and hole mass and g value parameters. (Author)

AD-258 203 Div. 25, 9
(26 June 61) OTS price $5.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
MAGNETIC DIFFUSION IN A SHOCK-PRODUCED PLASMA,
by Arthur T. Lewis. 3 Oct 60, 45p. incl. illus.
(Contract AF 33(616)7624, Proj. 3145)
(WADD TR 60-836) Unclassified report

DESCRIPTORS: *Magnetic fields, *Diffusion, Copper, Magnetic susceptibility, *Magneto-hydrodynamics, Analysis, *Shock waves, Shock tubes.

The problem is treated of a plasma, produced by a shock wave, moving along a cylindrical shock tube and encountering an inhomogeneous, axially symmetric magnetic field. The output of a search coil is related to the magnetic Reynolds number of the flow, and the magnitude of the magnetic Reynolds number for which the magnetic field can begin to strongly affect the plasma flow is found. The behavior at the limits of very low and very high magnetic Reynolds numbers is calculated for the condition that the imposed magnetic field does not affect the plasma flow. The calculated behavior is then compared at the limits with measurements made with the use of a solid copper slug. It was found that a magnetic Reynolds number, Rm, greater than 60 is necessary to exclude a large fraction of the magnetic field from the interior of the conductor. Magnetic diffusion effects are not measurable until an Rm of 5 is reached, and the exclusion of more than 90% of flux from the search coil does not occur until Rm greatly exceeds 100. Measurements made with plasmas indicate that an appreciable fraction of the magnetic field is excluded from the plasma at high shock velocities, which gives the conditions necessary for studying the effects of magnetic forces on the plasma flow. Comparison with the copper slug measurements (AD-258 204) shows that a Rm of 20 was reached and allows the conductivity of the plasma to be calculated and compared with its theoretical values. (Author)

AD-258 204 Div. 25
(26 June 61) OTS price $7.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
DIFFUSION OF A MAGNETIC FIELD INTO A MOVING CONDUCTOR,
by John K. Oddson. 3 Oct 60, 67p. incl. illus.
(Contract AF 33(616)7624, Proj. 3145)
(WADD TR 60-837) Unclassified report

DESCRIPTORS: *Magnetic fields, *Diffusion, Copper, Conductors, Magnetic susceptibility, *Magnetohydrodynamics, Analysis.

A study is made of the diffusion of a magnetic field into a copper slug as it traverses the air gap of a magnet. The results are discussed in terms of the magnetic Reynolds number of the system, a dimensionless parameter proportional to the ratio of a characteristic diffusion time and the transit time through the field region. With the use of an approximate, single decay model of the diffusion process, the variation of magnetic flux is predicted and compared with the experimentally obtained response of search coils situated in the air gap. The peak flux change may be expressed in a non-dimensional form where the appropriate magnetic Reynolds number is proportional to, but considerably smaller than, the usual definition involving a critical conductor dimension as the characteristic length. A short discussion is included on the possibility of utilizing this effect in an energy conversion device. (Author)

AD-258 207 Div. 25
(26 June 61) OTS price $1.60

Raytheon Mfg. Co., Waltham, Mass.
THE CHARACTERISTICS AND APPLICATION OF A SIMPLE QUARTZ MICROBALANCE,
by Wolsky and E. J. Zdanuk. Scientific rept. no. 1 on Investigation of Effects of Ion-Induced Defects on Surface Reactions. 22 May 61, 7p. illus. (Rept. no. S-285)
(Contract AF 19(604)8004)
(AFCRL-381) Unclassified report

DESCRIPTORS: Balances, *Microbalances, Quartz, *Crystals, Instrumentation, Ion bombardment, Thin films, Surfaces, *Solid state physics.

The characteristics of several quartz microbalances are studied. The sensitivity of these balances was observed as a function of load. A comparison is made of the behavior of balances with 0.070 in. and 0.030 in. beams. The added utility of a balance whose sensitivity varies not too sharply with load is discussed. Further information is presented concerning the application of the vacuum microbalance to surface and sputtering investigations. (Author)

AD-258 209 Div. 25, 15
(23 June 61) OTS price $2.60

Stanford U., Calif.
ANALYTIC PROPERTIES AND RESCATTERING CORRECTION TO THE BORN APPROXIMATION FOR TRANSITION MATRIX ELEMENTS,
by B. Bosco. Mar 61, 22p. (Technical note no. 38)
(Contract AF 49(638)388)
(AFOSR TN-664) Unclassified report

DESCRIPTORS: Matrix algebra, Integral equations, Functions, *Operators (Mathematics), *Scattering, Wave analysis, *Quantum mechanics, *Mass energy relation, Nuclear reactions.

The analytic properties of a matrix element of a general operator between a bound state and a scattering state are studied in the framework of Schrodinger theory. It is shown that the singularities of such a matrix element are easily inferred from those of the Born approximation. Using the fact that the possible singularities which are not contained in the Born approximation are located far apart from those included in the lowest approximation, a simple formula is derived which allows one to obtain the rescattering correction to the Born approximation using explicitly the phase shifts. (Author)

AD-258 211 Div. 25, 8, 14
(26 June 61) OTS price $3.60

Philips Labs., Inc., Irvington-on-Hudson, N. Y.
HEXAGONAL MAGNETIC MATERIALS FOR MICROWAVE APPLICATIONS,
by D. J. DeBitetto, F. K. du Pre and others. Quarterly progress rept. no. 5, 15 Jan-14 Apr 61. 14 Apr 61, 35p. incl. tables (Case no. 13-145)
(Contract DA 36-039-sc-85279)
Unclassified report

DESCRIPTORS: *Magnetic materials, *Ferromagnetic materials, Microwave equipment, *Ferrites, Resonance absorption, Barium compounds, Titanium compounds, Cobalt compounds, Iron compounds, Strontium compounds, Aluminum compounds, Oxides, Single crystals, Magnetic properties, Crystal structure, Preparation, Magnetic fields, Ceramic materials.

Oriented samples of SrO·1.7Al2O3·4.3Fe2O3 were prepared. In the BaO·x [(TiCo)O3] · (6-x)Fe2O3 series, materials with x = 0.48 and 0.78 are being prepared. Work continued toward the preparation of toroidal samples of BaO·0.48 [(TiCo)O3] · 5.52Fe2O3 in which the direction of easy magnetization is required to be circumferential. The room temperature saturation magnetization of SrO·1.7Al2O3·4.3Fe2O3 was 20 gauss-cc/gram. The insertion losses of BaO·x [(TiCo)O3] · (6-x)Fe2O3 were measured for the compositions x = 0.48 and 0.68. Ferromag-

netic resonance was observed in the latest addition to the family of SrO·xAl2O3·(6-x)Fe2O3 materials, namely x = 1.7. Measurements were made in the 2 mm wavelength range. The anisotropy field was 53,400 oersteds. A single crystal of BaO·0.2Al2O3 5.8Fe2O3 was investigated for its ferromagnetic resonance. The sample was polished and its absorption line recorded in the M band. The anisotropy field was 19,700 oersteds. (Author)

AD-258 216 Div. 25
(23 June 61) OTS price $22.25

Shockley Transistor Corp., Mountain View, Calif.
THIN COMPOSITIONAL LAYERS IN SILICON,
by A. Goetzberger and H. Queisser. Final rept. 14 Jan 61, 1v. incl. illus. tables, 39 refs.
(Contract AF 19(604)5524)
(AFCRL-333) Unclassified report

DESCRIPTORS: *Silicon, *Diffusion, Oxidation, Boron, Phosphorus, Impurities, *Crystals, Growth, Mathematical analysis, *Semiconductors, Electrical properties, Life expectancy.

Research is reported in three major sections. Part I deals with diffusion, with emphasis on the techniques of preparation and the properties of thin diffused layers. The multiple predeposit technique improved uniformity. Box diffusion was found better than open-tube diffusion, with the platinum box superior to a quartz box. Simultaneous oxidation and diffusion of boron and phosphorus yielded higher diffusion constants than those, reported by others. Part II discusses the properties of junctions, especially imperfect junctions. Gettering techniques were developed to remove or prevent metal precipitates which caused excess reverse current below avalanche breakdown. A study of light emission from reverse biased p-n junctions revealed 2 types of microplasmas which may be related to certain crystal faults. A theroretical study analyzed the phenomena of secondary ionization, avalanche breakdown and microplasma phenomena in a simplified model. Part III reports on diffusion along grain boundaries. Silicon bicrystals were grown with one or more small angle grain boundaries. Diffusion of impurities parallel to the dislocations was found to be enhanced at grain boundaries. A new mathematical treatment of diffusion down dislocations is presented and on its basis the experimental results are discussed. Properties of p-n junctions at grain boundaries are related to possible device applications. (Author)

AD-258 218 Div. 25, 17
(22 June 61) OTS price $8.60

Research Chemicals, Inc., Burbank, Calif.
REFRACTORY GADOLINIUM AND HAFNIUM COMPOUNDS,
by R. C. Vickery and H. M. Muir. Final rept. 18 May 59-1 May 60. May 60, 88p. incl. illus. tables, 12 refs. (Rept. no. RC 145)
(Contract NObs-77145)
(ARPA Order no. 81-59) Unclassified report

DESCRIPTORS: *Refractory materials, *Gadolinium alloys, Hafnium alloys, *Intermetallic compounds, *Gadolinium compounds, *Hafnium compounds, Antimonides, Bismuth compounds, Borides, Selenides, Silicides, Phosphides, Semiconductors, Physical properties, Electrical properties Processing, Preparation, Induction heating, *Thermoelectricity, Resistance, Melting, Materials, Sintering, Electric arcs.

Gd compositions with Bi, Sb, Si, B, P and Se, and Hf compounds with Si and B have been examined for their potential as thermoelectric materials. Seebeck potentials, resistivities and melting points have been determined. Several refractory systems have been uncovered, with melting points as high as 3000 C, and compounds in the Gd-Se systems have demonstrated a possible value as a thermoelectric material. In the Gd-Se system Seebeck outputs as high as 500 microvolt/C have been obtained but this and resistivities have been found to vary unconventionally with treatment and mild variations in composition. (Author)

AD-258 220 Div. 25, 8, 14
(22 June 61) OTS price $2.60

Raytheon Co., Waltham, Mass.
NONLINEAR MICROWAVE DIELECTRIC MATERIALS,
by G. Rupprecht, B. D. Silverman and others. Quarterly progress rept. no. 2, 16 Dec 60-15 Mar 61, 15 Mar 61. 25p. incl. tables (Rept. no. S-262)
(Contract DA 36-039-sc-87369)
Unclassified report

DESCRIPTORS: *Dielectrics, Microwave equipment, Microwaves, Ferroelectricity, Crystals, Single crystals, Growth, Physical properties, *Phase shifters, Dielectric properties, Heat treatment, Barium compounds, Strontium compounds, Titanates, Design, Preparation, Ceramic materials, Sapphires, Ruby.

The effect of heat treatment upon microwave losses at 20 kMc/sec for some barium-strontium titanate (BST) mixtures with different preparation was studied. The results are compared to those obtained with single crystalline SrTiO3. For a BST-50 hot-pressed polycrystalline sample the nonlinearity constant was measured and compared with the directional average over the anisotropic nonlinearity constant in single crystalline SrTiO3. Flux-grown single crystals of BST mixtures were tested for constancy of composition by different methods, in particular by X-ray diffraction. The flame fusion apparatus for the growth of single crystals has been completed and was successfully tested by the growth of ruby and sapphire crystals. A microwave phase shifter has been assembled. (Author)

AD-258 222 Div. 25, 8, 30
(26 June 61) OTS price $1.10

Institute of Mathematical Sciences, New York U., N. Y.
(No title)
Status rept. for 1 Mar-31 May 61. 19 June 61, 4p.
(Contract Nonr-28525)
Unclassified report

DESCRIPTORS: *Polarization, Solid state physics, *Anthracenes, Crystals, *Memory devices, Computers.

The work done on exploration of p.i.p. (persistent internal polarization) for memory applications is described. Experiments primarily to investigate the symmetry of anthracene single crystal faces were carried out. (Author)

AD-258 242 Div. 25
(20 June 61) OTS price $2.60

Israel Inst. of Tech., Haifa.
VELOCITY DEPENDENT CORRELATIONS IN THE STATISTI-

CAL DISTRIBUTION OF THE ELECTRIC MICROFIELD IN A PLASMA,
by Amiram Ron and G. Kalman. 25 Mar 61, 27p. incl. illus. (Technical note no. 3)
(Contract AF 61(052)177)
(ARL-71) Unclassified report

DESCRIPTORS: *Plasma physics, *Particles, *Polarization, Ions, Velocity, Statistical analysis, Statistical distributions, Electric fields.

The polarization of the plasma particles in the neighborhood of a moving ion depends on the ion velocity. This affects the distribution of the stochastic field acting upon the ion. Correction to the Holtsmark distribution due to the complete test particle - field particle correlation including this dynamic effect is calculated up to the order e to the second power. The result is: (1) shift toward smaller fields, (2) anisotropy and (3) velocity dependence, which is not equal to the zero velocity effect even on the average. (Author)

AD-258 254 Div. 25, 15
(19 June 61) OTS price $1.60

Naples U. (Italy).
UNITARITY CONDITIONS IN TERMS OF PROPAGATION KERNELS,
by E. R. Caianiello, H. Umezawa, and B. Preziosi. 30 Mar 61, 13p. (Technical note no. 2)
(Contract AF 61(052)434)
(AFOSR-857) Unclassified report

DESCRIPTORS: *Operators (Mathematics), *Quantum mechanics, Particles, Scattering, Integral equations, Perturbation theory, *Inelastic scattering, Integration, Propagation.

If the group property (macroscopic causality of the U-matrix (S-matrix computed between finite initial and final times) is postulated, the proof of its unitarity reduces to a most simple verification on the propagation kernels of the theory. The Appendix gives an explicit proof of that property for electro- and meso-dynamics by means of perturbative expansions, which may be easily generalized. (Author)

AD-258 256 Div. 25, 30
(19 June 61) OTS price $1.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
HIGH SPEED COMPUTER SYSTEM RESEARCH,
by E. W. Fletcher and A. L. Loeb. Quarterly progress rept. no. 2, 1 Jan-31 Mar 61. 30 Apr 61, 14p. incl. illus. 15 refs.
(Contract NObsr-77603)
Unclassified report

DESCRIPTORS: *Computers, Digital computers, *Thin films, Metal films, *Vaporization, *Solid state physics, Magnetic fields, *Magneto-optic rotation, Reflection, Light, Ferromagnetism, *Algebra, Crystals, Topology.

Contents:
Measurement and control of processes in high vacuum
Fundamental physics of the thin-film state
The Kerr magneto-optic effects in ferromagnetic films
The polar Kerr effect
The transverse Kerr magneto-optic effect
Investigation of the Kerr magneto-optic effect on various materials
Optical study of switching and magnetic thin films
Measurement of the Kerr effect in nickel-iron films
Crystal algebra
The calcium silicide structure

AD-258 259 Div. 25
(19 June 61) OTS price $5.60

Marine Physical Lab., U. of Calif., San Diego.
RESONANCE ABSORPTION IN SOLID CYCLOHEXANE,
by Robert Arvid Rasmussen. 1 Apr 61, 46p. incl. illus. 17 refs. (SIO ref. no. 61-6)
(Contract Nonr-221605)
Unclassified report

DESCRIPTORS: *Cyclohexanes, Resonance absorption, Single crystals, Acoustics, Theory, Lattices, Atomic structure, Molecular structure, Attenuation, Measurement, Vibration, Sound, Solids, Solid state physics, Adsorption, Mathematical analysis.

According to the resonance absorption theory proposed by L. N. Liebermann (Phys. Rev. 113:1052, 1959), large acoustic attenuations can occur in molecular crystals as the result of weak coupling among lattice and intramolecular oscillators near resonance. Theoretical and experimental investigations have been undertaken for the purpose of testing this theory. A refinement of Liebermann's original theory is presented and employed to calculate the absorption coefficient for crystalline cyclohexane. The apparatus and techniques utilized to grow large crystals and to measure the absorption are described, and the experimental results are compared to those predicted by the theory. The close agreement between theory and experiment observed in this comparison together with Liebermann's results for benzene offer strong support for the resonance absorption theory. (Author)

AD-258 319 Div. 25, 15
(26 June 61) OTS price $2.60

Chalmers U. of Tech. (Sweden).
THE ELECTROMAGNETIC COUPLING BETWEEN AN ELECTRON BEAM AND INCIDENT PLANE WAVES FOR AN AXIALLY FINITE INTERACTION DOMAIN,
by Hans Wilhelmsson. Jan 60, 17p. incl. illus. 66 refs. (Research rept. no. 5)
(Contract AF 61(052)159)
(AFCRL-170) Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Electron beams, Coupling circuits, Velocity, Alternating current, *Electromagnetic fields, Mathematical analysis, Propagation.

AD-258 322 Div. 25
(22 June 61) OTS price $1.10

Naples U. (Italy).
A SOLVABLE MODEL OF FIELD THEORY,
by E. R. Caianiello and A. Campolattaro. 21 Mar 61, 8p. (Technical note no. 1)
(Contract AF 61(052)434)
(AFOSR-639) Unclassified report

DESCRIPTORS: *Quantum statistics, Integral equations, Electromagnetic fields, Series, Electromagnetic theory, Operators (Mathematics).

AD-258 323 Div. 25, 20
(22 June 61) OTS price $1.60

Uppsala U. (Sweden).
O+ STATES OF Sm152 AND Gd152,
by I. Marklund, O. Nathan and others. 1960, 15p. incl. tables.
(Contract AF 61(052)13; In cooperation with Copenhagen U. (Denmark))
(AFOSR-651) Unclassified report

DESCRIPTORS: *Samarium, *Gadolinium, Isotopes, *Nuclear energy levels, Excitation, Quantum mechanics.

The decay of Eu-152m (9.2 h) is studied by means of internal and external conversion and e(-)-gamma coincidence measurements with particular interest focused on the possible low-lying O+ levels in the transition region between spherical and non-spherical nuclei. (Author)

AD-258 337 Div. 25
(22 June 61) OTS price $1.60

Hebrew U. (Israel).
A STUDY OF THE LOW TEMPERATURE TRANSITION IN MAGNETITE AND THE INTERNAL FIELDS ACTING ON IRON NUCLEI IN SOME SPINEL FERRITES, USING MOSSBAUER ABSORBTION,
by R. Bauminger, S. G. Cohen, A. Marinov and others. Jan 61, 10p. incl. illus. table (Technical note no. 3)
(Contract AF 61(052)347)
(AFOSR-657) Unclassified report

DESCRIPTORS: *Low temperature research, Iron, *Magnetite, *Ferrites, Nuclei, Lattices, Solid state physics, Magnetic fields, *Ferromagnetism, *Transition temperature.

A study has been made of the internal fields acting on Fe-57 nuclei in some spinel ferrites, with particular reference to the low temperature order-disorder transition in magnetite, using the techniques of Mossbauer absorbtion. For the Fe(+++) ions at both the octahedral and tetrahedral sites in nickel ferrite at 300 K, Gamma Fe203 at 85 K and 300 K, and magnetite at 85 K, the effective magnetic field at the Fe-57 nuclei is the same and equal to about 5.1 x 10 to the 5th power oe. In magnetite, the value of H(eff) in the Fe(++) ions is about 4.5 x 10 to the 5th power oe at 85 K. Measurements on magnetite at room temperatures provide a microscopic confirmation of Verwey's hypothesis that above the transition temperature of magnetite there is a fast exchange between the ferrous and ferric ions in the octahedral sites. The average value obtained for the chemical shift (relative to stainless steel) for the Fe(+++) ions in the various cases investigated was about .045 cms/sec; the value for the Fe(++) ions in magnetite at 85 K was about 0.115 cms/sec. (Author)

AD-258 340 Div. 25, 4, 7, 14
(22 June 61) OTS price $1.10

Ohio State U. Research Foundation, Columbus, Ohio.
THERMOELECTRIC MATERIALS,
by Henry E. Wenden, S. R. Ali Zaidi and Thomas S. Shevlin. Bimonthly progress rept. no. 4, 1 July-31 Aug 60. 4 Sep 60, 5p. incl. illus. (Rept. no. 1039-4)
(Contract NObs-78254)
Unclassified report

DESCRIPTORS: *Thermoelectricity, Temperature, Voltage, Sodium compounds, Vanadium compounds, Oxides, Melting, Materials, Electrical properties, Electrons, Scattering, Heating.

An apparatus using metal tubes was fabricated for studying the differential Seebeck coefficient of liquid materials. Ceramic spacers about 1/2-in. long whose outside diameters were the same as the inside diameter of the outer metal tube, were placed on the inner stainless tube at 1/2-in. intervals. The space between the ceramic spacers was filled with powdered Na20.6V205 (I). Other components and characteristics included the outer stainless steel tube, a water cooling coil, a cooling air inlet, a cooling air outlet, a thermocouple for the outside temperature of the outer tube, and a thermocouple for the inside temperature of the inner tube. The composite tube placed inside a tubular furnace so that only the central part of the tube was heated. A very small emf was generated for various temperature differences. A similar composite tube was built only 1-in. long with I in the middle and the ends sealed by ceramic spacers. A large emf was generated for a small temperature difference.

AD-258 347 Div. 25, 17
(26 June 61) OTS price $.75

Minnesota U., Minneapolis.
EFFECT OF STRESS NONLINEARITY ON EXTREMAL STATISTICS AND FATIGUE LIFE OF A SIMPLY SUPPORTED BAR,
by Richard H. Lyon. Dec 60, 18p. incl. illus.
(Contract AF 33(616)6828, Proj. 7351)
(WADD TR 60-437) Unclassified report

DESCRIPTORS: *Beams, Stresses, Fatigue (Mechanics), Vibration, Vibration mechanisms, Noise, Statistical distributions, Mathematical analysis.

The statistics of the extrema of the stress at the surface of a supported bar are studied when the lowest mode of the bar is excited by random noise. The stress is a nonlinear function of displacement because the hinged ends have a fixed separation. The effect of this nonlinearity on the distribution of maxima and minima is calculated assuming that the tensile stress does not significantly affect the displacement statistics. The effect of nonlinearity on expected fatigue life is calculated for a linear fatigue law. It is found that nonlinearity may significantly diminish the expected fatigue life. (Author)

26. PRODUCTION AND MANAGEMENT

AD-257 623 Div. 26, 6
(14 June 61) OTS price $1.10

Defense Research Lab., U. of Texas, Austin.
A MODIFIED CAPSTAN FORCE AMPLIFIER,
by J. H. Henson. 5 July 60, 7p. incl. illus.
(DRL AF Technical memo. no. 52)
(Contract AF 33(616)5164, Proj. 4025)
(Appendix A to ASD TN 61-37, AD-323 616)
Unclassified report

DESCRIPTORS: *Pulleys, *Power amplifiers, Theory, Aircraft defense systems, Design, Amplifiers, Tests.

The best-known force amplifier is the common capstan drive. The principal disadvantage of this device is the crawling of the line parallel to the driving drum. The sliding of the line back toward the center of the concave driving drum produces intermittent jerking of the take-up line. A modified capstan drive which eliminates this undesirable crawling and consequent jerking has been designed and built. Basically, the function of this device is to reel in under load and store under reduced tension many layers of line. The device is a low-speed, lightly-loaded unit. However, there appears to be no reason why the drive could not be scaled either up or down in size or speed. (Author)

AD-257 653 Div. 26, 17
(14 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SCIENTIFIC REPORTS OF HIGHER SCHOOLS, MACHINE CONSTRUCTION AND INSTRUMENT CONSTRUCTION (SELECTED ARTICLES).
10 Jan 61, 24p. 12 refs. (Trans. no. MCL-124 from Nauchnyye Doklady Vysshey Shkoly, Mashinostroyeniye i Priborostroyeniye 3:pp. 122-131, 141-148, 1958)
Unclassified report

DESCRIPTORS: Castings, USSR, Scientific reports, Industrial research, *Casting, *Molding materials, Molding, Sand, Clays, Mixtures, Water, Binders, Bonding, Theory, Production, Preparation, Processing, Physical properties, Viscosity, Porosity, Elasticity, Metals, Mathematical analysis, Precision finishing, Machining, Machine shop practice, Standards, Specifications, Alloys.

CONTRIBUTION TO THE THEORY OF PACKING FOUNDRY MOLDS, by G. F. Balandin: The preparation of sand molds with a clay-water binder is described and the mechanism of packing the mixture is analyzed. Equations are derived for the determination of the energy or work expended in filling a 250 x 250 x 100-mm mold box with a mixture containing 15% clay and 5.3% water. Good correlation was obtained between calculated and experimental data. EVALUATING THE PRECISION OF CASTINGS, by Yu. A. Vorobyev: The development of modern machine construction is characterized by refinements in the precision of the processing of castings, from the cast billet to the machined component. The extension of engineering standards established for machining operations to the foundry industry are discussed. Results are reviewed of an investigation for the purpose of establishing precision standards for castings of non-ferrous alloys.

AD-257 663 Div. 26, 17
(14 June 61) OTS price $5.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SOLDERING OF METALS (SELECTED ARTICLES)
by N. F. Lashko and S. V. Lashko-Avakyan.
13 Jan 61, 57p. incl. illus. tables, 113 refs. (Trans. no. MCL-430 from Payka Metallov, Moscow: pp. 344-357; 381-393; 421-424, 1959)
Unclassified report

DESCRIPTORS: USSR, Metals, *Soldering, Soldering fluxes, *Brazing, Stainless steel, Tool steel, Molybdenum, Tungsten, Titanium, Zirconium, Tantalum, Beryllium, Titanium alloys, Zirconium alloys, Tantalum alloys, Alloys, Soldering alloys, Silver solders, Soldered joints, Heat resistant alloys, Films, Oxidation, Mechanical properties.

Contents:
Soldering and brazing of stainless chromium steels
Brazing of tool steels and hard alloys
Brazing and soldering of molybdenum and tungsten
The soldering and brazing of titanium, zirconium, tantalum, and their alloys
Soldering of beryllium

AD-257 665 Div. 26, 17
(14 June 61) OTS price $9.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ACHIEVEMENTS IN SCIENCE AND TECHNOLOGY AND ADVANCED PRACTICES IN INDUSTRY AND CIVIL ENGINEERING.
31 Oct 60, 105p. incl. illus. tables. (Trans. no. MCL-465 from Dostizheniya Nauki i Tekhniki i Peredovoy Opyt v Promyshlennosti i Stroitel'stve. Vyp. 4: Tekhnologiya Mashinostroyeniya (Obrabotka Metallov Rezaniyem):pp. 3-71; 77-79; 97; 125-129; 148-156, 1959)
Unclassified report

DESCRIPTORS: USSR, *Industrial equipment, Civil engineering, Mechanical engineering, *Machine tools, Machines, Automation, Cutting tools, Metals, Alloys, *Machining, Spark machining, Ultrasonics, Machine shop practice, Manufacturing methods, Control systems, Industrial research, Processing, Design.

Contents:
Scientific achievements and advanced experience in cutting metals
Perfecting machine-construction technology
The effectiveness of introducing newly produced metal-cutting machine tools in industry
Modernization of equipment as a resource in increasing production output
Ways of automating metal-cutting machines
Modernization of the operating stock of machine tools

AD-257 666 Div. 26
(14 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ECONOMIC EFFICIENCY IN USING UNIVERSAL MACHINERY (Ekonomicheskaya Effektivnost' Primeneniya Universal'nykh Prisposobleniy)
by A. M. Murashov and N. A. Klimov. 31 Oct 60, 6p. incl. illus. table (Trans. no. MCL-470 from Vysokoproizvoditel'nyye Prisposobleniya k Metallorezhushchim Stankam:pp. 147-151, 1959).
Unclassified report

DESCRIPTORS: *Machine tools, Machine tool industry, *Cutting tools, *Lathes, Clamps, Industrial equipment, Metals, Metallurgy, USSR, *Industrial production, Production, Manufacturing methods, Machines, Costs, Economics.

AD-257 669 Div. 26, 17, 30
(14 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NEW METHODS OF CONTROL AND DEFECTOSCOPY IN

Division 26 - PRODUCTION AND MANAGEMENT

MACHINE BUILDING AND INSTRUMENT CONSTRUCTION
(Novyye Metody Kontrolya I Defektoskopii V Mashinostroyenii I Priborostroyenie).
1 Nov 60. 7p. incl. illus. (Trans. no. MCL-474 from Nauchno-Tekhnicheskoye Obshchestvo Priborostroitel'noy Promyshlennosti:pp. 230-233, 1958)
Unclassified report

DESCRIPTORS: *Gages, Test equipment, *Quality control, *Steel, *Metals, *Metal coatings, *Coatings, Iron, Surfaces, Surface properties, Magnetic properties, Measurement, Calibration, Detection, Thickness, Metallurgy, Instrumentation, *Non-destructive testing, USSR.

Tests on cores of various permeability (from KhVG, Armco, and No. 10 steels) were conducted on a MT-DAZ instrument and confirmed the character of the dependence of the instrument readings on magnetic permeability which was established by the magnetic field theory. MT-DAZ thickness gages were also used in research to determine the effect of the thickness of a coating of mechanical properties, the efficiency of current output, and the uniformity of the coatings. The electromagnetic MT-DAZ thickness gage favorably differs from other examined instruments by its rather wide measuring range, stability, and accuracy of readings, and its minor dependence on the properties of the parts being measured. (Author)

AD-257 670 Div. 26, 17
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ARGON SHIELDED ARC WELDING (Zvaranie v Ochrane Argonu)
by Jan Novotny. 1 Nov 60, 15p. (Trans. no. MCL-475 from Zvaranie 9:276-282, 1959)
Unclassified report

DESCRIPTORS: Czechoslovakia, Welding, *Arc welding, Argon, Aluminum, Aluminum alloys, Oxidation, Electrodes, Alternating current, Electric arcs.

The development of argon-shielded arc welding in Czechoslovakia is discussed. The principal use of this method is for obtaining welds of good quality in Al and its alloys. Both consumable electrodes and non-consumable tungsten electrodes are employed, but the non-consumable electrode seems to be preferred. Argon-shielded arc welding equipment is manufactured in Czechoslovakia in 4 sizes for industrial applications as well as an experimental unit. Semiautomatic welding is still in developmental stages.

AD-257 679 Div. 26, 17
(14 June 61) OTS price $10.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MANUFACTURE AND USE OF POROUS BEARINGS (Tekhnologiya Proizvodstva I Primeneniye Poristykh Podshipnikov)
by A. D. Moshkov and Ya. V. Uspenskiy. 2 Nov 60, 123p. incl. illus. tables, 94 refs. (Trans. no. MCL-556 from Tekhnologiya Proizvodstva I Primeneniye Poristykh Podshipnikov: 83p., 1959)
Unclassified report

DESCRIPTORS: *Bearings, Materials, Copper, Iron, Tin, Graphite, *Powder alloys, *Powder metals, *Powder metallurgy, *Metallurgy, Manufacturing methods, Production, Processing, Sintering, Porosity, Mechanical properties, Quality control, Machines, Industrial equipment, USSR, Porous materials, *Porous metals.

The book sets forth certain basic theoretical concepts in the manufacture of porous materials for sliding bearings; the results of studies and the influence of technological factors on the physical and mechanical properties of porous copper-base and iron-base materials are given; specific practical recommendations are given on the organization of the manufacture of porous bearings and on their use in machine construction. (Author)

AD-257 686 Div. 26
(14 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
METHODS OF FINISHING MACHINE PARTS USING ABRASIVE TOOLS (SELECTED PART),
by G. G. Lur'ye. Feb 61, 15p. (Trans. no. MCL-667 from Metody Otdelki Detaley Abrazivnymi Instrumentami, Moscow: pp. 92-103, 1958)
Unclassified report

DESCRIPTORS: USSR, Metals, *Abrasives, Grinders, Machining, *Machine tools, Surfaces, Abrasion, *Precision finishing, Cutting fluids, Coolants, Industrial equipment, Plastics, Alloys.

An experimental investigation of the process of band grinding produced the following conclusions: (1) the effectiveness of the process was affected most by unit pressure, width of band, velocity and cross feed of band, as well as the diameter of the surface to be worked; (2) with increasing band velocity up to 25 m/sec the unit removal of metal rises in a convex curve, further increase of velocity involves an appreciable drop of unit removal; (3) with increasing band velocity the rate of wear rises following a concave curve, while the height of the micro-roughness diminishes linearly; (4) with increasing unit pressure the removal of metal rises in a convex curve, while the rate of the band wear, the unit loss of abrasives, and the effective grinding power rise in a concave curve; (5) with increasing diameter of the surface to be ground the removal of metal, rate of band wear, the unit loss in abrasives, and the magnitude of the micro-roughness follow the pattern of a declining hyperbolic curve; (6) the rate of metal removal decreases with increasing hardness and plasticity of the metal to be machined; and (7) the finish of the ground surface improves as the hardness of the metal being machined increases. (Author)

AD-257 687 Div. 26
(14 June 61) OTS price $4.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AUTOMATIC CONTROL OF METAL-CUTTING MACHINE TOOLS; AUTONATION SYSTEMS AND THEIR USE (CHAPTERS 9 AND 13),
by V. A. Barun and A. A. Budinskiy. Feb 61, 39p. (Trans. no. MCL-669 from Avtomaticheskoye Upravleniye Metallorezhushchikh Stankov; Sredstva Avtomatizatsii I Ikh Ispol'Zovaniye, Moscow:pp. 203-221, 256-257, 1959)
Unclassified report

DESCRIPTORS: USSR, *Machine tools, *Machining, Automation, Control systems, Programming, Servomechanisms, Computers, Digital computers, Analog-to-digital converters, Analog computers, Punched card methods, Magnetic recording systems, Metals, *Cutting tools, Automatic.

Contents: Programs for the operation of automatic control systems - Code programs (Principles of operation of control systems with coded programs; Punched programs, Magnetic programs, Programs on cinematographic films, Plug-in panels and commutators for control programs, Push-button programs); and Uncoded programs (Magnetic programs, Programs on perforated tapes, Plug-in and push-button programs, Templates and standards, Programs with rotary switches, Programming Command-apparatus, Programming command-apparatus with cards); Follow-up automatic control systems of mechanical type: Time-dependent systems (Basic automatic control mechanisms, Single-shaft control systems, Two-input-shaft control systems); and Automatic control system - Basic concepts; Servosystems with a computer collation device.

AD-257 692 Div. 26, 17
(14 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
WELDING OF EI 712 STEEL (12KH2NVFA),
by F. Ye. Tretyakov and Ye. Yu Freydlina.
Nov 60, 5p. incl. tables. (Trans. no. MCL-708)
Unclassified report

DESCRIPTORS: USSR, *Steel, *Welding, Welded joints, Welds, Arc welding, Mechanical properties, Welding rods, Argon, Carbon dioxide, Arc welds.

Weldability tests were carried out on specimens and structures made of EI712 steel with a thickness of 1.5; 1.8; 2 and 3 mm in annealed, normalized and hardened states prior and after the welding. Test plates were automatically welded in a carbon dioxide and an argon medium using an electrode wire 18KHMA, manual argon-arc welding with an Sv-08A wire and manual arc welding with a metal electrode type UONI-13/55 with a rod made of Sv-08A wire. The results showed that welded units of EI712 steel, regardless of the welding method and thermal processing of details prior to or after the welding had high strength and plasticity. (Author)

AD-257 722 Div. 26, 1, 9, 12
(27 June 61) OTS price $8.10

Dynamic Analysis and Control Lab., Mass. Inst. of Tech., Cambridge.
BASIC RESEARCH AND DEVELOPMENT IN FLUID POWER CONTROL FOR THE UNITED STATES AIR FORCE.
Progress rept. no. 6, Mar 61, 78p. incl. illus.
(Contract AF 33(616)6120, Proj. 8225)
(WADD TR 60-868) Unclassified report

DESCRIPTORS: *Hydraulic systems, *Pneumatic systems, *Control systems, Gas generating systems, Servo motors, Gas bearings, *Pneumatic servomechanisms, Pneumatic valves, Servo systems, Hydraulic servomechanisms, *Hydraulic power systems, Design, Tests, Control valves, Jets.

The development of high performance hydraulic and pneumatic control equipment for advanced systems is discussed. Increased emphasis on high pressure pneumatic components and systems reflects the approach to an ultimate objective of employing hot-gas power to operate such systems. Control valves, relays, servomotors, gas bearings, fluid power and signal transmission, hot-gas contamination, hot-gas gyros, and techniques of control are treated. (Author)

AD-257 733 Div. 26, 17
(16 June 61) OTS price $1.50

Battelle Memorial Inst., Columbus, Ohio.
FUNDAMENTAL STUDIES ON THE MECHANISM OF ULTRASONIC WELDING,
by W. J. Lewis, J. N. Antonevich and others.
Rept. for Mar-July 59 on Metallic Materials.
Dec 60, 44p. incl. illus. tables, 12 refs.
(Contract AF 33(616)6268; Proj. 7351)
(WADD TR 60-607) Unclassified report

DESCRIPTORS: *Heat resistant alloys, *Welding, *Ultrasonics, Spot welds, Sheets, Shear stresses, Fracture (Mechanics), Mechanical properties, Hardness, Tensile properties, Welded joints, Surface properties, Airframes, Microstructure, Aluminum alloys, Molybdenum alloys, Niobium, Nickel alloys, Stainless steel, Titanium alloys, Copper, Iron, Nickel, Titanium, Aluminum.

The fundamental mechanisms of ultrasonic welding and the application of this process to the joining of various heat-resistant materials were investigated. Previous studies which had shown the effects of time, temperature, and clamping force on ultrasonic welds were expanded to include studies of the shear force during welding. Ultrasonic spot welds made in various combinations of heat-resistant alloys generally confirmed the results of previous work with these alloys. Cracks were found at the edges of the spot welds in most of the material combinations studied. The effects of these cracks on weldment properties varied with the material. The presence of a reaction zone, apparently consisting of intermetallic compounds, was apparent in ultrasonic welds made between Ti and stainless steel. These findings indicate that ultrasonic welding is not suitable for the production of aircraft-quality spot welds in heat-resistant and dissimilar metal combinations. It is apparent as a material's hardness increases, and the ratio of tensile strength to yield strength decreases, that weldability by the ultrasonic process decreases. (Author)

AD-257 746 Div. 26, 1, 12, 19
(16 June 61) OTS price $3.60

General Electric Co., Philadephia, Pa.
STUDY OF PARAMETERS WHICH AFFECT PELLET FLOW TYPE ACCELEROMETERS,
by William Nicolini. Monthly rept. no. 4,
1-30 Sep 60, Sep 60, 35p. incl. illus. tables.
(Contract DA 36-034-ORD-3230)
Unclassified report

DESCRIPTORS: Pellets, *Accelerometers, Spheres, Glass, *Processing, *Surface properties, Friction, Separation.

Contents:
Details of work performed during September 1960
Effect of electrostatic charge and humidity on efflux rate
Emmission spectrographic analysis of GE and Magnavox beads
Parameters to consider
Follower piston weight

Mathematical analysis of an accelerometer in flight
Beads available for efflux testing
Linde metal spheroids
Appendix
Analysis of piston weight data on efflux devices
Correction of calculations of percentage of beads in range
Revision of experimental plan for efflux testing

AD-257 758 Div. 26, 25
(15 June 61) OTS price $1.60

Knights, James, Co., Sandwich, Ill.
GLASS ENCLOSED MINIATURE CRYSTAL UNITS CR(XM29)U,
by C. W. Snyder. Quarterly rept. no. 1, July 60-Jan 61. Jan 61, 10p. incl. illus.
(Contract DA 36-039-sc-81298)
Unclassified report

DESCRIPTORS: *Crystal holders, *Seals, Glass seals, *Crystals, Design, *Heating elements, Manufacturing methods, Vacuum seals, Nickel alloys, Iron alloys, Miniature electronic equipment, Glass.

Efforts are being made to study methods of sealing the glass base and bulb of quartz crystal units by means other than gas and O flame. A vacuum-tight seal was effected between bulb and base by means of a Globar-type resistance heating element. Research was started on the design of heating elements with longer life to allow for necessary expansions and better electrical coupling measures. Another approach to effect seal was to use a nichrome wire-type heating element that conforms to the outside shape of the bulb. Limited trials were made of this technique.

AD-257 813 Div. 26, 17, 31
(15 June 61) OTS price $2.60

Republic Steel Corp., Canton, Ohio.
DEVELOPMENT OF FUSION WELDING TECHNIQUES FOR TWO INCH THICK TITANIUM PLATES (GRADE RS-70, COMMERCIALLY PURE)
by J. Savas. Final rept. and Bi-monthly rept. no. 6, 1 Mar-30 Apr 61. May 61, 21p. incl. illus. tables.
(Contract NOa(s) 60-6091-F)
Unclassified report

DESCRIPTORS: *Titanium alloys, Titanium, *Metal plates, *Welding, Welding rods, Welded joints, Welds, Titanium wire, Arc welding, Processing, Heat treatment, Hydrogen, Submarine hulls, Ship hulls, Ship plates, Tests, Tensile properties, Non-destructive testing, Mechanical properties.

Testing was completed on the first 2 experimental weldments of 2-in.-thick, commerically pure Ti plate. The 3rd, 4th, and 5th sets of the 2-x 4-x 24-in. plates, which were machined to a number of variations of a modified double-V joint design, were welded, radiographed, sectioned, and tested. An optimum modified double-V joint design was decided upon for the machining and welding of the 2-x 15-x 30-in. plates into a 2-x 30-x 30-in. weldment. The best welding techniques developed during the welding of the first 5 experimental weldments were used. The X-ray radiograph of the weldment showed it to be free from porosity, cracks, and other defects capable of detection by this means of non-destructive inspection. (Author)

AD-257 915 Div. 26
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
RELIABILITY ENGINEERING, QUALITY ASSURANCE AND CONTROL.
19 May 61, 5p. (AID rept. 61-71)
Unclassified report

DESCRIPTORS: Reliability, USSR, *Quality control, *Bibliography, *Manufacturing methods.

This bibliography was prepared pursuant to the requirement for a literature survey of Soviet retrospective and current sources on reliability engineering, quality assurance and control. The entries are given in alphabetical order by author and are not otherwise classified. Titles include materials available at the Air Information Division. The bibliography covers the period from 1955 to 1961. (Author)

AD-257 940 Div. 26, 1
(20 June 61) OTS price $10.50

Republic Aviation Corp., Farmingdale, N. Y.
DESIGN AND DEVELOPMENT OF A 1000 F HYDRAULIC SYSTEM, PART III. PHASE II INVESTIGATION,
by William E. Mayhew. June 60, 125p. incl. illus. tables.
(Contract AF 33(616)6411, Proj. 8128)
(WADD TR 59-430, pt. 3) Unclassified report

DESCRIPTORS: *Hydraulic actuators, *Hydraulic systems, *Hydraulic valves, Design, High temperature research, Hydraulic fluids, Servomechanisms, *Hydraulic servomechanisms, Control systems, Aircraft equipment, *Hydraulic seals, Hydraulic reservoirs, *Hydraulic fluid filters, *Pumps, Materials, Test facilities.

Information is presented on the design and fabrication of the components to be used in a hydraulic system where a significant portion of the system will operate at a fluid temperature of 1000 F in an ambient temperature of 1200 F. Further work with regard to the phenoxyphenyl ether previously chosen as the most promising fluid for this system is described. The results of a seal test program, including static and dynamic seals, are also included. In addition, the facilities designed, fabricated, and procured to evaluate the system mockup in the required environments are described. (Author)

AD-258 026 Div. 26, 15
(21 June 61) OTS price $1.10

Numerical Analysis Research U. of Calif., Los Angeles.
A CRITERION FOR DETERMINING THE NUMBER OF IDENTICAL MACHINES TO BE INSTALLED AT A MACHINE CENTER.
by Zivia S. Wurtele. 1 June 61. 5p.
(Contract Nonr-23302)
Unclassified report

DESCRIPTORS: *Management engineering, Standards, *Mathematical analysis, Series, *Machine shop practice, Functions, Probability, Scheduling, Operations research.

A criterion is derived for determining the number of identical machines to be installed at a machine center, under the following conditions:

(1) jobs arrive in a Poisson-type time series; (2) the processing time distribution has a finite second moment; (3) there is a lag between a job's arrival and its processing; and (4) production conditions are sufficiently flexible so that the cost of adjusting to small deviations in the volume of jobs that arrive is negligible; whereas large deviations involve the taking of appropriate actions by management and the incurring of fixed costs. (Author)

AD-258 054 Div. 26, 12, 17
(20 June 61) OTS price $2.60

Lodge and Shipley Co., Cincinnati, Ohio.
FABRICATION OF AN HK31A MAGNESIUM ALLOY AIRFRAME SKIN,
by Roy O. Sweeney and J. A. Warnken. Monthly progress rept. no. 2, 1-31 Mar 61 on Magnesium Alloy Airframe. 19 Apr 61, 24p. incl. illus. tables.
(Contract DA 33-008-ORD-2084, Proj. TN2-8106)
Unclassified report

DESCRIPTORS: *Airframes, *Magnesium alloys, Processing, Design, Production, Manufacturing methods, Configuration, Conical bodies, Metal plates.

Calculations based on Floturn and spinning principles were made to establish the configuration of the second and first operations from station 23 to station 48. Part drawings for the first 4 operations were completed and, when approved, the required tooling for each operation will be designed and manufactured.

AD-258 137 Div. 26, 17
(21 June 61) OTS price $9.60

Universal-Cyclops Steel Corp., Bridgeville, Pa.
TUNGSTEN SHEET ROLLING PROGRAM.
Technical progress rept., Phase 1, 29 Sep-29 Dec 60. 29 Dec 60, 1v. incl. illus. tables. 78 refs.
(Contract AF 33(600)41917)
(AMC TR 7-827, vol. 1) Unclassified report

DESCRIPTORS: *Tungsten, *Tungsten alloys, *Sheets, *Rolling mills, Processing, Powder metallurgy, Electric arcs, Melting, Powder metals, Electrodes, Extrusion, Forging, Castings, Physical properties, Mechanical properties, Oxidation, Casting.

This report includes:
Battelle Memorial Inst., Columbus, Ohio.
DEVELOPMENT OF NEW OR IMPROVED TECHNIQUES FOR THE PRODUCTION OF TUNGSTEN SHEET. A STATE-OF-THE-ART SURVEY, by D. J. Maykuth, V. D. Barth, and H. R. Ogden. 29 Dec 60, 1v. illus. tables.
(Subcontract to Universal-Cyclops Steel Corp., Bridgeville, Pa., Contract AF 33(600)41917)
A state-of-the-art survey of W sheet rolling was completed. Industry capabilities as related to raw material availability, consolidation practices, and conversion methods were analyzed. Domestic tungsten sheet is available in sizes less than one-half the width and less than one-fifth the length of that desired. The survey indicates that two consolidation techniques should be initially followed, i.e., arc melting and powder metallurgy. For the arc-cast work pure tungsten is recommended as the alloy, while for the powder metallurgy work K-100 powder is recommended. Several conversion techniques will be employed for initial breakdown of the as-cast structure. The survey indicates that the arc-cast material should be extruded and then forged or rolled directly. However, preliminary data indicated that direct forging can be accomplished and should be investigated. (Author)

AD-258 142 Div. 26
(23 June 61) OTS price $1.00

Watervliet Arsenal, N. Y.
INVESTIGATION OF SHELL MOLDING SURFACE DEFECTS,
by M. L. Slawsky, F. A. Heiser and B. L. Bramfitt. Dec 60, 30p. incl. illus. 31 refs. (Technical rept. no. WVT RI 6004-I)
(OCO proj. no. 479-59(ORD))
Unclassified report

DESCRIPTORS: Surface properties, Casting, Steel, *Castings, *Steel castings, Calcium, Silicon, Manganese, Temperature, Carbon, Oxidation, Alloys, *Molding, Hardening, Surfaces, Additives, Resins, Calcite, Zirconium compounds, Silicates.

The sheel casting surface defect, commonly called the 1020 defect from its incidence in low carbon, low alloy steels, has been shown to be a pinhole-type defect. Its occurrence in low carbon, low alloy, steel castings has been investigated and the effects of various factors, molding and metallurgical, have been determined. Based upon the results, techniques have been established to eliminate the occurrence of the defect. It is shown that deoxidation with calcium-silicon-manganese, rather than with aluminum, and control of pouring temperature will effectively control the pinholing. Alternatively, the use of additives which cause a faster solidification rate of the casting is beneficial. The techniques developed are applied to several components. (Author)

AD-258 195 Div. 26, 17
(23 June 61) OTS price $8.60

Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
TUNGSTEN FORGING DEVELOPMENT PROGRAM,
by F. N. Lake, E. J. Breznyak, G. S. Doble. Interim technical progress rept. no. 4, 27 Mar-27 May 61. May 61, 1v. incl. illus. tables.
(Rept. no. ER-4441)
(Contract AF 33(600)41629)
(AFSC TR 7-797, Vol. 4) Unclassified report

DESCRIPTORS: *Tungsten, *Tungsten alloys, *Forging, Melting, Extrusion, Powder alloys, Powder metallurgy, Electric arcs, Dies, Refractory coatings, Flame spraying, Microstructure, Heat treatment.

A forging process has been developed whereby arc melted and extruded W-15%Mo bar stock can be forged to complex structural shapes. Successful application of the process has been demonstrated through forging of a universal configuration containing varying thickness, varying draft angle, and thin web and rib sections. The process is particularly significant because it utilizes commercial die steels and conventional heating and forging equipment, thus establishing a baseline for industry capability in forging tungsten alloys to structural shapes. Tensile properties for the W-15%Mo forgings at 3000 F and 3500 F are reported for areas of both high and low forging reduction. Tensile and stress rupture tests conducted between 3000 F and 4000 F indicate that W-15%Mo and W-0.52%Cb have approximately equal strengths within this temperature range, and that W-15%Mo is slightly weaker in the same temperature range. (Author)

AD-258 245 Div. 26, 14
(20 June 61) OTS price $1.10

Narmco Industries Inc., San Diego, Calif.
POTENTIAL OF FILAMENT WOUND COMPOSITES,
by W. H. Otto. Monthly progress rept. no. 3, 1-31 May 61. June 61, 5p. incl. illus.
(Contract NOw-61-0623-c)
Unclassified report

DESCRIPTORS: *Filament wound construction, Glass textiles, Resins, Laminates, Glass, Stresses, Thermal stresses, Mechanical properties, Tensile properties, Reinforcing materials, Theory, Fracture (Mechanics), Filaments, Aging, Fibers, Epoxy resins.

A technique was developed to make model test composites with one or more monofilaments embedded in resin in preferred orientations. Using polarized light, strain was observed in the resin resulting from cure, particularly at the ends of fibers and between adjacent fibers. Monofilaments of Pyrex 7740 composition were formed by pulling from the end of a rod of this glass, rotated in an oxygen-hydrogen flame. Epon 820 resin, manufactured by Shell Chemical Company, was used with the shell curing agent Z. (Author)

AD-258 300 Div. 26
(21 June 61) OTS price $1.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
SHELF LIFE TEST OF THE FOUR GRAIN S-68 SQUIB IN THE B10179 CABLE CUTTER,
by Kenneth A. Kartchner. Airmunitions test rept. May 61, 11p. incl. illus. (Rept. no. OOY TR 61-26)
Unclassified report

DESCRIPTORS: *Cable and chain cutters, Effectiveness, Life expectancy, Tests, Temperature, Steel, Wire, Copper wire.

The purpose of this test was to verify the shelf life of the S-68 four grain Squib and to determine its effectiveness as a power source for operating the the B10179 Cable Cutter, now used on the Moody Reel, which handles a banner target on the T-33A Aircraft. Tests were conducted in which 50 squibs from three lots and one B10179 Cable Cutter were used to cut 1/8-inch armored and unarmored steel cable. Some of the above squibs were conditioned to 160 F and some to -65 F before functioning in the cable cutter. The functioning of the S-68 four grain Squib was satisfactory and of sufficient strength to operate the B10179 Cable Cutter. After 50 operations the cutting edge of the cable cutter became dull but was still able to cut the 1/8-inch steel cable. The S-68 four grain Squib is recommended for use in the B10179 Cable Cutter. The shelf life of the S-68 four grain Squib is 5 years for this application. (Author)

27. PROPULSION SYSTEMS

AD-257 723 Div. 27
(16 June 61) OTS price $1.60

Aerojet-General Corp, Azusa, Calif.
CHARGED-COLLOID PROPULSION SYSTEM,
by R. B. Edmonson and N. C. Miles. Quarterly rept. no. 3, 1 Jan-31 Mar 61. Apr 61, 2p. incl. illus. (Rept. no. 0290-01-3)
(Contract AF 49(638)656)
Unclassified report

DESCRIPTORS: *Electric propulsion, *Electrostatics, *Electric fields, Colloids, Thrust, Sprays, Liquids, Drops, Oils, Porous materials, Porous metals, Feed mechanisms, Design.

Activity was limited primarily to the design, construction, and evaluation of various feed systems for electrostatic spraying in vacuum. The feed system, utilizing a non-conductive, porous fiber as a spray source was found to have limiting voltage operating conditions. A feed system was constructed where instead of a spray wedge, a convex porous exit surface is provided with a fine-micron porous-metallic element from which an oil-spray tip is pulled upon application of an electric field. (Author)

AD-257 861 Div. 27
(21 June 61) OTS price $2.60

AeroChem Research Labs., Inc., Princeton, N. J.
THE PROPULSIVE EFFICIENCY OF A LOW-THRUST PULSED EXHAUST ROCKET IN FIELD-FREE SPACE,
by F. T. Kuehner. Apr 61, 17p. incl. illus. tables (Technical pub. no. 28)
(Contract Nonr-277300)
Unclassified report

DESCRIPTORS: *Rocket propulsion, Integral equations, Mathematical analysis, Specific impulse, *Exhaust gases, Velocity, *Rocket motors, Exhaust systems, *Rockets, Tests.

The propulsive efficiency of a low-thrust, pulsed exhaust velocity rocket in field-free space is compared with that of a constant exhaust velocity rocket. The efficiency investigated is the actual velocity at burnout normalized by the velocity a zero payload rocket would attain if all the kinetic energy of the exhaust, taken with respect to the rocket, was converted to vehicle velocity. The square-wave shaped pulse is shown to give the same efficiency as the constant exhaust velocity case, while in the asymptotic extreme of many pulses per mission the other pulse shapes considered give lower efficiencies. It is also shown that the characteristics of an optimized pulsed exhaust velocity rocket must be calculated in a manner slightly different from that of the constant exhaust velocity case. This is because the optimum exhaust velocity for a constant exhaust velocity rocket, in general, does not equal the optimum average exhaust velocity for an otherwise similar pulsed exhaust velocity rocket. Also the efficiency, delta V/V sub c is usually less. (Author)

AD-257 923 Div. 27, 1, 12
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
PUMPS FOR LIQUID-PROPELLANT ENGINES (BOOK NOTE).
25 May 61, 1p. (AID rept. 61-83, Trans. from Theory and Design of Pumps for Liquid-Propellant Engines; Moskva, Oborongiz: 246p., 1960)
Unclassified report

DESCRIPTORS: Rocket motors, Liquid rocket propellants, Fuel systems, *Fuel pumps, *Rocket propulsion, Design, Pumps, USSR, Theory.

The book is compiled from a summary of lectures given by the author and from materials published in the Soviet and non-Soviet press. The characteristics and requirements of liquid-propellant pumps are considered on the basis of fuel data published in the non-Soviet press. Design parameters used in the text are taken from pump systems of known non-Soviet liquid-propellant engines. (Author)

AD-257 976 Div. 27, 17
(26 June 61) OTS price $1.25

Defense Metals Information Center, Columbus, Ohio.
EVOLUTION OF ULTRAHIGH-STRENGTH, HARDENABLE STEELS FOR SOLID-PROPELLANT ROCKET-MOTOR CASES,
by H. J. Hucek, A. R. Elsea, and A. M. Hall.
25 May 61, 40p. incl. illus. tables, 36 refs.
(DMIC rept. no. 154)
(Contract AF 33(616)7747)

Unclassified report

DESCRIPTORS: Rocket motors, *Rocket cases, Solid rocket propellants, *Steel, Mechanical properties, Heat treatment, Alloys, Welding, Processing, Preparation, Melting, Vacuum furnaces, Tool steel, Hardness, Sheets, Martensite, Austenite, Phase transitions, Hydrogen embrittlement, Manufacturing methods, Materials.

The evolution of the current roster of special steels which are used or are being considered for use in solid-propellant rocket cases, and their relationship to the older, more familiar steels are discussed. The evolution is traced from AISI 4130, through AISI 4340 and its modifications, and includes the 5Cr-Mo-V steels (hot-work die steels). The discussion covers the influence of composition on performance and properties, response to tempering and the effects of tempering, and the differences and similarities among the steels. Also included are comments on such matters as fabrication, welding, heat treating, notch sensitivity, decarburization, high-temperature properties, and the benefits of vacuum melting. (Author)

AD-258 052 Div. 27, 12, 26
(19 June 61) OTS price $1.60

Lyon, Inc., Detroit, Mich.
DEEP DRAWN PRE-PRODUCTION UNITS, A2 1ST STAGE POLARIS ROCKET MOTOR CHAMBERS AND A2 1ST STAGE POLARIS AFT CLOSURES,
by Wayne A. Martin. General rept. no. 7, 28 Feb-31 Mar 61. 31 Mar 61, 16p. incl. illus.
(Contract NOw 60-0630)

Unclassified report

DESCRIPTORS: *Guided missiles, Underwater-to-surface, Surface-to-surface, *Rocket cases, *Rocket motors, *Booster rockets, *Guided missile boosters, Dies, Forging, Processing, Metallurgical analysis, *Machine tools, Tests, Tensile properties.

AD-258 305 Div. 27, 17
(26 June 61) OTS price $4.60

Budd Co., Philadelphia, Pa.
DEVELOPMENT OF HIGH PERFORMANCE ROCKET MOTOR CASE,
by R. C. Dethloff. Engineering progress rept. no. 11, 1-31 May 61. 31 May 61, 50p. incl. illus. tables.
(Contract DA 36-034-ORD-3296)

Unclassified report

DESCRIPTORS: Rocket motors, *Rocket cases, Materials, Steel, Welded joints, Welding, Spot welds, Design, Titanium alloys, Mechanical properties, Tensile properties, Tests, Heat treatment, Stainless steel.

The evaluation of materials for rocket motor cases was continued. Data are presented for 25 and 20% Ni steels and JLS 300 alloy. The 20% Ni steel had a better response to heat treatment than the 25% Ni steel. A limited stress corrosion study was made on resistance spot welded JLS 300 to develop comparison data. Two concentrations, 5 and 20%, boiling MgCl2 solution were used. Only one specimen showed evidence of cracking. Results of a qualitative evaluation of designs of cylindrical sections based on materials data furnished by suppliers indicated that the base material must have a strength weight ratio in excess of 1 x 10 to the 6th power, and that a cylindrical section with a preferentially oriented helical butt weld offered the best possibility of attaining an over-all chamber strength to density ratio of 1 x 10 to the 6th power or better.

28. PSYCHOLOGY AND HUMAN ENGINEERING

AD-257 606 Div. 28, 5, 18
(14 June 61) OTS price $2.60

Human Sciences Research, Inc., Arlington, Va.
METHODOLOGY FOR DETERMINING INFORMATION AND DISPLAY REQUIREMENTS FOR COMMAND OF AN ADVANCED SUBMARINE. A CASE STUDY IN SYSTEM RESEARCH METHODOLOGY,
BY W. S. Vaughan, Jr. Dec. 60, 17p. incl. illus., 2 refs. (Rept. no. 4; HSR-RM-59/24-Sm)
(Contract Nonr-252500)

Unclassified report

DESCRIPTORS: *Display systems, Submarines, Communication systems, Submarine personnel, Military personnel, Test methods, Control systems, Naval operations, Naval personnel, *Information theory, *Job analysis, *Operations research.

The purpose of the research was to provide information requirements which could be used to guide design of a display console for the commander of a next-generation submarine. The practical need for improved displays appropriate for command control of an advanced system posed a research problem of bridging the gap between the projected capabilities of submarine equipment and requirements for information displays. This problem was treated as two parts: first, a general rationale or logic of research steps was developed to bridge the gap, and second, the logic was reduced to a set of research procedures. These two research problems are the topics discussed in this paper: the logic of the research approach, and the sequence of procedures used to develop a foundation of requirements to support display recommendations. (Author)

AD-257 609 Div. 28, 5
(14 June 61) OTS price $12.50

Human Sciences Research, Inc., Arlington, Va.
INFORMATION REQUIREMENTS METHODS AS APPLIED TO DEVELOPMENT OF DISPLAYS AND CONSOLES,
by W. Dean Havron and James P. Jenkins. Mar 61, 1v. incl. illus. 137 refs. (Rept. no. 12; HSR-RR-61/4-Sm)
(Contract Nonr-252500)

Unclassified report

DESCRIPTORS: *Information theory, Design, *Military personnel, Display systems, *Communication systems, Control systems, Military operations, Training, Test methods,

Analysis, Effectiveness, Cybernetics, Job analysis, Naval personnel, Human engineering, *Operations research.

An integrated set of steps is described by which the analyst proceeds from system concept to an operationally tested console. Emphasis is placed on operational requirements for the system, and on human factors considerations. (Author)

AD-257 719 Div. 28, 5
(16 June 61) OTS price $3.60

Applied Psychology Corp., Arlington, Va.
DESIGN STANDARDS FOR MAN-MACHINE TASKS IN SIGNAL CORPS SYSTEMS,
by Charles E. Zeleny, F. Joseph McGrane, and Herman D. Lerner. Quarterly progress rept. no. 7, 1 Jan-1 Apr 61. 1 Apr 61, 24p. incl. tables.
(Contract DA 36-039-sc-78328)
Unclassified report

DESCRIPTORS: *Human engineering, Standards, Effectiveness, Electronic equipment, Control systems, Display systems, Combat, Design, Mathematical analysis, Job analysis, *Communication equipment, Cybernetics.

Criteria and measurements of task effectiveness in the utilization of combat surveillance equipment controls and displays are specified. The mathematics of organizing task effectiveness scores into an index of systems effectiveness is illustrated. (Author)

AD-257 870 Div. 28, 12, 23
(20 June 61) OTS price $9.10

Lockheed Aircraft Corp., Sunnyvale, Calif.
PERSONNEL SUBSYSTEM TESTING AND EVALUATION FOR MISSILES AND SPACE SYSTEMS. AN ANNOTATED BIBLIOGRAPHY,
comp. by R. C. Gex. Apr 61, 102p. (Special Bibliography no. SB-61-21; Rept. no. 3-36-61-1)
Unclassified report

DESCRIPTORS: *Bibliography, Maintenance, *Human engineering, *Guided missiles, Air traffic control systems, Training devices, Training, Aviation personnel, Guided missile personnel, Maintenance personnel, *Handbooks, Weapons, Design.

There are 259 references included in this bibliography. Most of these contain abstracts. The emphasis is on evaluation of performance of teams of personnel engaged in operating and maintaining complex man-machine systems. Training and training equipment, personnel requirements and human engineering studies were included if they contained information relevant to personnel evaluation. Sources checked: ASTIA, LMSD reports catalog, AFBMD reports catalog, STL reports catalog, Air University Periodical Index, and Psychological Abstracts. References to classified reports are included. The titles were taken from unclassified sources. (Author)

AD-257 883 Div. 28, 15
(21 June 61) OTS price $2.60

California U., Los Angeles.
CHOICE BEHAVIOR AND MONETARY PAYOFF: STRONG AND WEAK CONDITIONING,
by Richard C. Atkinson. Technical rept. no. 9 on Models for n-Person Decision and Communication Processes. 15 May 61, 21p. incl. tables, 10 refs.
(Contract Nonr-23358, Proj. NR 170-282)
Unclassified report

DESCRIPTORS: *Behavior, *Conditioned reflex, Probability, Group dynamics, *Games theory, Mathematical analysis, Learning, *Sequential analysis.

AD-257 895 Div. 28, 16
(21 June 61) OTS price $3.60

Research Center for Group Dynamics, U. of Michigan, Ann Arbor.
STUDIES ON DRIVE AND INCENTIVE IN PERCEPTION. III: SOME EFFECTS OF DRIVE ON STIMULUS GENERALIZATION OBTAINED WITH A REVISED TRAINING PROCEDURE,
by Robert B. Zajonc and Susan E. Karp. Apr 61, 30p. incl. tables, 20 refs. (Technical rept. no. 8)
(Contract AF 49(638)367)
Unclassified report

DESCRIPTORS: *Needs, *Sensory perception, *Stimulation, Tests, Vision, Hearing, Skin, Intensity, Sound, Pitch discrimination, *Reaction (Psychology), Anxiety, Conditioned reflex, Electroshock, Mathematical prediction, Effectiveness, Auditory perception, *Proprioception, Tonal thresholds.

A procedural modification was developed in order to clarify the results of testing the hypothesis that within certain intensity ranges, the perceived stimulus intensity is a monotonically increasing function of drive and the actual stimulus intensity. This change in procedure prevented the formation of negative gradients which eleminated a possible effect due to variation in the response threshold and the distances between the training stimuli. It was found that there were significant curve shifts under the two drive conditions, thus supporting the experimental hypothesis. However, the effects found were generally weaker than those observed under the previously used procedure. (Author)

AD-258 224 Div. 28, 23
(26 June 61) OTS price $1.60

Human Engineering Lab., Aberdeen Proving Ground, Md.
THE EFFECTS OF TWELVE HOURS CONFINEMENT IN MOBILE ARMORED PERSONNEL CARRIERS ON SELECTED COMBAT RELEVANT SKILLS: STUDY IV,
by Samuel A. Hicks and Russell B. Randall. May 61, 11p. incl. illus. tables (Technical memo. no. 2-61)
(Proj. TB1-1000)
Unclassified report

DESCRIPTORS: Combat, Effectiveness, Tanks, *Military personnel, Tests, Design, Psychomotor tests, Confinement, *Stress (Psychology), Time.

This investigation is the fourth in a series designed to determine changes in general combat relevant performance as a result of sustained confinement in Armored Personnel Carriers (APCs). The purpose of this investigation was to determine changes in performance as a result of 12 hours confinement in mobile APCs. Forty enlisted men were tested before and after confinement on tests designed to measure stamina, eye-arm coordination, locomotor coordination, equilibrium and hand-arm steadiness. The 12-hour confinement period resulted in statistically significant losses in stamina and locomotor coordination. Recommendations are included for future research. (Author)

AD-258 349 Div. 28, 16
(22 June 61) OTS price $4.60

Adjutant General, Dept. of the Army, Washington, D. C.
THE ARMY NIGHT SEEING TESTER. DEVELOPMENT AND USE,
by Julius E. Uhlaner and Joseph Zeidner. May 61, 41p. incl. illus. tables (HFRB Technical research rept. no. 1120)
(Proj. 2L95-60-001)

Unclassified report

DESCRIPTORS: *Dark adaptation, *Visual acuity, Measurement, *Night warfare, *Military personnel, Tests, Test equipment, Brightness, Surface targets, Detection, *Visual perception, *Psychometrics, Psychology, Illumination, *Test sets.

Research was conducted concurrently on basic experimentation into human individual differences in the night seeing process and on the development of instruments to test night seeing ability. Experimental testing revealed two major factors to be involved: (1) brightness contrast sensitivity and (2) visual acuity detail. A useful relationship was also determined between seeing ability at intermediate (moonlight) levels of illumination and at very low (starlight or moonless) levels. Development of instrumentation for night vision testing resulted in the engineering of the ANST-II, a compact, portable, rugged, and easy to use model. Field use, under varying conditions, demonstrated its practicability usefulness, and reliability in meeting Army night seeing testing needs. An ANST-II prototype has been made available to USCONARC for possible use in meeting various requirements for identifying soldiers possessing night vision ability. (Author)

29. QUARTERMASTER EQUIPMENT AND SUPPLIES

AD-257 615 Div. 29
(14 June 61) OTS price $1.10

Springfield Coll., Mass.
THE EFFECTS OF SOLE DESIGN AND COMPOSITION UPON THE LENGTH OF THE FOOTPRINT LEFT DURING WALKING,
by Peter V. Karpovich and Philip D. Gollnick.
5 June 61, 5p. table.
(Contract DA 49-007-md-889)

Unclassified report

DESCRIPTORS: *Shoes, Design, Materials, Rubber, Leather, Combat, *Military equipment.

The effects were investigated of sole design and composition upon the length of footprints that are formed during walking. Since it was logical to assume that longer step might be the result of a momentary elongation of the outsole during walking, it was decided to measure the length of footprints made by various types of outsoles in standing and walking. Significant differences were obtained with ripple and Tru-glide outsoles. The footprints were longer than the outsoles. The mechanism responsible for this increase in length probably depends on a forward glide of the shoe as the weight of the body is shifted over the compressible ripples. The greater increase observed in walking can no doubt be attributed to the additional force placed upon the ripples by the forward motion of walking.

AD-258 003 Div. 29, 14, 30
(21 June 61) OTS price $4.60

Army Research Office, Office of the Chief, Research and Development, Washington, D. C.
TECHNOLOGICAL FORECAST 1961. VOLUME 5. QUARTERMASTER CORPS.
1961, 46p. incl. illus.

Unclassified report

DESCRIPTORS: Textiles, Food, Deterioration, Microbiology, Military equipment, Materials, Combat, Handling, Rubber, *Military research, Body armor, *Scientific research.

Contents:
Textile research
Body armor research
Food research
Rubber research
Microbiological deterioration research
Combat materials handling equipment

AD-258 088 Div. 29, 16
(23 June 61) OTS price $7.60

Naval Supply Research and Development Facility, Bayonne, N. J.
THE EFFECT OF THE USE OF DEHYDRATED POTATO GRANULES ON THE SUBSISTENCE OPERATIONAL READINESS OF NAVAL VESSELS,
by B. S. MacNulty, D. C. Hascall and others.
4 Jan 61, 1v. incl. illus. tables.

Unclassified report

DESCRIPTORS: *Potatoes, *Food, Economics, Dehydrated substances, Military requirements, Biochemical tests, Acceptability, Enzymes, Diet, Preparation.

One pound of dehydrated potato granules is equivalent to five pounds of peeled eyed fresh potatoes or 6.5 pounds of unpeeled fresh potatoes. Based on existing Navy menus and recipes, 28.8% of the total fresh, white potato requirement is used in mashed-potato type recipes. The substitution of dehydrated potato granules for 28.8% of the fresh potato requirement represents an overall 24.2% saving in weight, 24.7% saving in storage space, 15.2% overall cost saving and man-hour savings. A minimum of 0.766 man-hour is required to machine-peel and hand-eye 100 lbs. of fresh potatoes which represents a potential labor-saving that can be realized by using dehydrated potato products. The existing specification, MIL-1073A test for adequacy of blanching and texture appears inadequate and requires modification to guarantee a uniform, high quality dehydrated product. (Author)

AD-258 296 Div. 29, 16
(26 June 61) OTS price $4.50

Naval Medical Field Research Lab., Camp Lejeune, N. C.
THE EFFECT OF SIMULATED TROPICAL CLIMATE ON THE PERFORMANCE OF MARINE CORPS PERSONNEL WEARING AN INTEGRATED BODY ARMOR-LOAD CARRYING SYSTEM (BALCS),
by J. J. Martorano, E. B. Cook, and C. S. Blyth.
May 61, vol. 11, no. 10, pp. 1-14, illus. tables, 22 refs,
(Proj. MR 005.01-0030)

Unclassified report

DESCRIPTORS: Marine Corps, Military personnel, *Body armor, *Naval personnel, *Stress (Physiology), Protective clothing, Climatic factors, Tests, Loading.

An attempt was made to determine to what extent the wearing of a body armor-load carrying system (BALCS) and the carrying of a total load of 54 pounds would affect the ability of a group of U. S. Marines to do a fixed amount of work under simulated tropical climatic conditions. Although the addition of the integrated body armor-load carrying system (BALCS) produced significant increases in the several physiological parameters measured, increases were within normal physiological limits for the 45-min period in which the subjects were exposed to the experimental conditions. Assessment of the adrenal cortical activity, as indicated by the measurements utilized in this study, suggested that neither the heat and humidity in which the subjects exercised nor the wearing of the BALCS was of a sufficient magnitude to cause measurable stress. (Author)

AD-258 333 Div. 29, 26, 33
(22 June 61) OTS price $2.60

Army Arctic Test Board, Fort Greely, Alaska.
SERVICE TEST OF CONTAINER, WEAPONS AND INDIVIDUAL EQUIPMENT PARACHUTIST'S, T59-4.
25 May 61, 1v. incl. illus. (Proj. no. ATB 3-131).
Unclassified report

DESCRIPTORS: *Containers, Tests, Packaging, *Air drop operations, Safety harness, Parachutes, Military equipment.

30. RESEARCH AND RESEARCH EQUIPMENT

AD-257 604 Div. 30, 24
(14 June 61) OTS price $4.60

David Taylor Model Basin, Washington, D. C.
SC 4020 MICROFILM RECORDER PROGRAMMING MANUAL I,
by R. Mejia, P. Battey and others. June 61,
46p. incl. illus. tables. (Rept. no. 1469)
Unclassified report

DESCRIPTORS: *Recording systems, *Microfilm selectors, *Digital computers, Programming, Instruction manuals, Operation, Coding, Engineering, Naval research.

The operation of the SC 4020 Microfilm Recorder on-line with the IBM 704 at the Applied Mathematics Laboratory is defined. The function and command structure of the various components of the recorder are described, and engineering features of the SC 4020 and of the CHARACTRON tube itself are included. The addition of a special subroutine package to the executive routine which controls the sequential execution of programs on the IBM 704 is covered. These basic subroutines for printing, plotting, and service functions are described, including the necessary calling sequences with samples. The necessary modifications to the command structure for off-line use of the SC 4020, including those required for use with the IBM 7090, are indicated. (Author)

AD-257 607 Div. 30, 5, 8, 28
(14 June 61) OTS price $2.60

Human Sciences Research, Inc., Arlington, Va.
MEASURING THE RELEVANCE OF AN ITEM OF INFORMATION TO THE COMMAND OF A COMPLEX MAN-MACHINE SYSTEM,
by Alvin L. Schreiber. Jan 61, 18p. incl. illus. 7 refs. (Rept. no. 10; HSR-TN-61/1-sm)
(Contract Nonr-252500)
Unclassified report

DESCRIPTORS: Digital computers, *Computers, Mathematical computer data, Effectiveness, Analysis, *Information theory, Data processing systems, Data storage systems, Data transmission systems, Tests, Test methods, *Military personnel, Naval personnel, Measurement, Learning, Probability, *Operations research, Research program administration.

A mathematical approach is presented on one of the most critical problems in development of command consoles and displays, i.e., the evaluation of the relevance of potential information inputs. It may be applied to any kind of proposed system to determine command information requirements when current methods may not be adequate to the task. (Author)

AD-257 621 Div. 30, 8, 12
(14 June 61) OTS price $9.60

Space Technology Labs., Inc., Los Angeles, Calif.
DIGITAL COMPUTER SYSTEMS STUDIES,
by T. Winkler. Semiannual rept. 1 July-31 Dec 60.
31 Dec 60, 103p. incl. illus. tables, 11 refs.
(Rept. no. STL/TR-60-0000-19224)
(Contract AF 04(647)619)
(AFBMD TN 61-2)
Unclassified report

DESCRIPTORS: *Digital computers, Data processing systems, Digital systems, *Data storage systems, Magnetic cores, Memory devices, *Delay lines, *Electronic circuits, Switching circuits, Packaging, Computers, Delay circuits, Trigger circuits, *Guided missiles, *Guidance, Programming, Analog to digital converters, Magnetostrictive elements, Feedback amplifiers, Design, Tests, Surface to surface, *Guided missile computers.

Methods are being investigated to improve the quality and reliability of missile guidance systems for WS 107A-1, WS 107A-2, WS 315A, and WS 133A. Study efforts were devoted to the following areas: (a) storage medium evaluation, (b) studies of input-output circuits, (c) design of circuit building blocks to support these efforts, and (d) studies of mechanical assembly methods. In addition to continuing work on circuits using delay lines as a storage medium, attention was given to three types of magnetic memories. The various components of the input-output circuits were analyzed, designed, and tested. Circuit building blocks were designed and subjected to operational tests. A method for packaging the various components was developed. (Author)

AD-257 627 Div. 30
(14 June 61) OTS price $1.60

Defense Research Lab., U. of Texas, Austin.
A POWER-SPECTRUM PROGRAM FOR THE IBM 650 COMPUTER,
by S. E. Smith. 15 Oct 60, 18p. incl. illus. tables (DRL AF Technical memo. no. 54; Supersedes DRL AF Technical memo. no. 54, AD-246 527)
(Contract AF 33(616)5164, Proj. 4025)
(Appendix C to ASD TN 61-37, AD-323 616)
Unclassified report

DESCRIPTORS: *Programming, *Digital computers, *Statistical functions.

The power-spectrum program described in this report uses for its input the autocorrelation function, as calculated by the program described in DRL AF Technical Memorandum No. 51. The spectrum program prepares a table of the cosines which will be needed and then generates appropriate look-up instructions for the cosines during the computation. This is considerably faster than recomputing each cosine as needed. The output of the spectrum program gives the frequency interval, the raw spectrum, the Hammed and Hanned spectra, and the cumulative or integrated versions of these three spectra. (Author)

AD-257 655 Div. 30, 8, 22
(14 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONVERTERS OF ROTATION ANGLES AND LINEAR DISPLACEMENTS INTO DIGITAL FORM (Preobrazovateli Uglov Povorota i Lineynykh Peremeshcheniy v Tsifrovuyu Formu)
by A. D. Talantsev. 17 Feb 61, 30p. incl. illus. (Trans. no. MCL-287 from Avtomatika i Telemekhanika 20:361-375, 1959)
Unclassified report

DESCRIPTORS: *Analog to digital converters, Circuits, Control systems, Guidance, Fire control systems, Digital recording systems, *Handbooks.

Converters of rotation angles and linear displacements are classified according to quantization methods and coding principles. Two methods for quantization of physical scale are distinguished; quantization with separation of point intervals and quantization with separation of discrete points. Converters with coding based on the principle of reading are grouped in conformance with methods for elimination of spurious codes. Descriptions of characteristic circuits and designs applied in practice are provided. Compiled on the basis of materials furnished by the foreign (Non-USSR) periodical literature, this article constitutes an attempt at some systematization of such devices. (Author)

AD-257 659 Div. 30
(14 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ABOUT A METHOD OF CONSTRUCTING DIGITAL DIFFERENTIAL ANALYZERS,
by L. A. Kozharskiy. 15 Feb 61, 22p. incl. illus. table (Trans. no. MCL-320 from Voprosy Teorii Matematicheskikh Mashin 1:219-230, 1958)
unclassified report

DESCRIPTORS: *Digital computers, Differential equations, Numerical analysis, *Integration, Exterior ballistics, Circuits, USSR, Numerical methods and procedures, Memory devices.

AD-257 699 Div. 30, 12
(14 June 61) OTS price $18.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DYNAMIC PROBLEMS OF CYBERNETICS (Dinamicheskiye Zadachi Kibernetiki),
by A. S. Kel'zon. 9 Feb 61, 1v. incl. illus. tables (Trans. no. MCL-731 from Gosudarstvennoye Soyuznoye Izdatel'stvo Sudostroitel'noy Promyshlennosti, Leningrad, 296p. 1959)
Unclassified report

DESCRIPTORS: *Cybernetics, *Control systems, *Automation, Pursuit courses, Flight paths, Guidance, Homing devices, Lead angle, Mathematical analysis, Differential equations, Transformations (Mathematics), Proportional navigation, Guided missiles, *Guided missile computers, Aerial rudders.

Concrete problems of modern technology, are used to show the application of the methods of cybernetics, as the science of the construction of systems of mechanical and electrical components to accomplish stable and purposeful operations, to the study of the synthesis of such devices. Selected problems of automatic control of motion are discussed to show the significance of the cybernetic approach to the investigation of modern engineering problems, and to develop the methods of cybernetics on the basis of concrete problems. Particular attention has been paid to the rational utilization of modern computers, both in research and in the synthesis of schemes of automatic control of motion. (Author)

AD-257 726 Div. 30, 8
(16 June 61) OTS price $1.60

Aerojet-General Corp., Azusa, Calif.
BUILDING BLOCK STUDY,
by P. O. Burk, and W. S. Simpson. Quarterly progress rept. no. 2, 19 Jan-19 Apr 61, 15 May 61, 10p. incl. illus. (Rept. no. 0447-01-2)
(Contract DA 36-039-sc-85159)
Unclassified report

DESCRIPTORS: Test equipment, *Electronic equipment, Programming, Automatic, *Test sets, *Maintenance equipment, Maintenance, Design, *Military equipment, Logistics, *Radio equipment.

Research was continued in the formulation of concepts for the design of an integrated system of modular test equipment to provide a capability of automatic field maintenance testing in the field army. A detailed analysis was made of current test techniques for two radio sets. Requirements and planning are discussed for a redirection of the program. (Author)

AD-257 774 Div. 30, 2
(16 June 61) OTS price $5.60

Photogrammetry Lab., Mass. Inst. of Tech., Cambridge.
THE PHOTOGRAMMETRIC CLOUD MEASUREMENT PROGRAM,
by D. R. Schurz and J. G. Houle. Dec 60, 47p. incl. illus. tables (Data Processing Technical rept. no. 1)
(Contract AF 19(604)4973)
(AFCRL-439)
Unclassified report

DESCRIPTORS: *Clouds, *Position finding, Measurement, Aerial photographs, *Programming, Digital computers, *Data processing systems, Mathematical analysis, Coding, Cameras, Calibration.

This program is conducted to determine the coordinates of a point in space using coordinates taken from a photograph and measured camera calibrations. The program consists of two parts; (1) The data adjustment program (DAP); which linearly adjusts data taken from the photographs, and (2) The general intersection program(GIP); which takes the output of DAP and with measured camera calibrations determines the coordinates in space in a normalized system of axes. No practical range restrictions are made. The input

data are treated as integers. Therefore, the output has the same scaling and significant figures as the input. DAP uses standard linear adjustment methods. GIP uses rotation and translation matrices based on photogrammetric work. DAP of the program uses approximately 700 locations; GIP uses approximately 1400 locations. DAP will run about 90 points per minute. GIP requires 4 seconds for computing the necessary matrices and operates on the data at the rate of about 50 points per minute. (Author)

AD-257 778 Div. 30
(15 June 61) OTS price $1.10

Lincoln Lab., Mass. Inst. of Tech., Lexington.
BASEBALL: AN AUTOMATIC QUESTION-ANSWERER,
by Bert F. Green, Jr., Alice K. Wolf and others.
1960, 6p.
(Sponsored by the Army, Navy, and Air Force)
Unclassified report

DESCRIPTORS: Documentation, Data processing systems, *Coding, Machine translation, *Computers, Programming.

Baseball is a computer program that answers questions phrased in ordinary English about stored data. The program reads the question from punched cards. After the words and idioms are looked up in a dictionary, the phrase structure and other syntactic facts are determined for a content analysis, which lists attribute-value pairs specifying the information given and the information requested. The requested information is then extracted from the data matching the specifications, and any necessary processing is done. Finally, the answer is printed. The program's present context is baseball games; it answers such questions as Where did each team play on July 7. (Author)

AD-257 839 Div. 30
(20 June 61) OTS price $.50

Army Research Office, Office of the Chief, Research and Development, Washington, D. C.
MACHINE TRANSLATION. A REVIEW AND ANALYSIS REPORT,
by Dimitri A. Kellogg. Feb 61. 39p. (ARO rept. no. 4)
Unclassified report

DESCRIPTORS: Computers, *Machine translation, Reading machines, *Data processing systems, Analysis.

A summary of the history, objectives, present status, and projected plans of the Army program in machine translation has been made. A similar review in less detail is included for all other government sponsored research in machine translation. The Army program consists of three major efforts: Machine translation of scientific literature from Russian to English; a similar program, from German to English; and the development of a print reader capable of scanning Russian journal pages to furnish input for the machine translation. Examples of results of present efforts are included. (Author)

AD-257 886 Div. 30, 2
(21 June 61) OTS price $11.00

United Electrodynamics, Pasadena, Calif.
RESEARCH STUDIES ON FREE FIELD INSTRUMENTATION,
by T. Winston. Final rept. 19 Dec 60, 1v. incl. illus. tables.
(Contract AF 29(601)1944, Proj. 1080)
(AFSWC TR 60-55) Unclassified report

DESCRIPTORS: *Pressure gages, Calibration, Explosions, Blast, *Pressure tanks, Instrumentation, Earth, *Stresses, Measurement, Nuclear explosions, Detection, Seismic waves.

This paper is the final report on a free field stress gage currently under development. The gage was tested under static and dynamic conditions to over 1,000 psi in a pressure tank especially designed and fabricated for this purpose. Present test results indicate that the gage reads within 10% of the free field stress up to somewhat beyond 200 psi. It is believed that future gages, developed along the same lines, will accurately measure free field stresses up to 1,000 psi. An important side result was the design and fabrication of a dynamic pressure tank used in gage development and evaluation. The tank is capable of producing static and dynamic pressures of over 1,000 psi. At present dynamic pressure rise times (time for pressure to reach 63% of its final value) range from 10 to 40 milliseconds. (Author)

AD-257 914 Div. 30, 32
(22 June 61) OTS price $1.10

Air Information Div., Washington, D. C.
REORGANIZATION OF SOVIET SCIENCE.
18 May 61, 7p. (AID rept. no. 61-70)
Unclassified report

DESCRIPTORS: *USSR, *Scientific organizations, Industry, Economics.

AD-257 919 Div. 30, 7, 8
(22 June 61) OTS price $1.10

Science and Tech. Section, Air Information Div. Washington, D. C.
RADIO MEASURING INSTRUMENTS MANUFACTURED IN THE USSR FOR THE ARMED FORCES.
22 May 61, 3p. (AID rept. 61-79, Trans. from Handbook for Electrical and Radio Measuring Instruments; V. 2: Radio Measuring Instruments; 3d ed. rev. and enl. Moskva, Voyenizdat, 526p. 1960)
Unclassified report

DESCRIPTORS: USSR, Armies, Technological intelligence, Measurement, Radiofrequency, *Frequency meters, Electronic circuits, *Test sets, Test equipment, Microwave equipment, Radio equipment, *Wavemeters, *Pulse generators, *Power meters, *Voltmeters, Design, Instrumentation.

A handbook is described which was intended for specialists in the USSR Armed Forces, and contains information on a total of 206 types of radio measuring instruments. Detailed descriptions of 156 instruments are presented. Data on purpose and uses, detailed specifications, and descriptions of structure and system of connections are given for each instrument listed. Most models are illustrated with photographs and block and connection diagrams. An alphabetical list of prices for most of the instruments is given. Fifty radio measuring instruments introduced between 1958 and 1959 are listed without prices. (Author)

AD-257 946 Div. 30, 12
(19 June 61) OTS price $10.50

Utah U., Salt Lake City.
THE INVESTIGATION OF THE FEASIBILITY OF AN ELECTROSTATIC ACCELERATOR FOR ACCELERATING MICRON-DIAMETER PARTICLES. PART I. VAN DE GRAAFF GENERA-

TOR. PART II. CHARGING OF MICRO PARTICLES,
by G. K. Jesperson, D. M. Reid and others. Preliminary rept. 15 Nov 60, 1v. incl. illus. tables, 25 refs. (Technical rept. no. OSR-20)
(Contract AF 49(638)462)
(AFOSR-719) Unclassified report

DESCRIPTORS: *Van de Graaff generators, Design, Tests, Mathematical analysis, Gas ionization, Electrostatic generators, Electric fields, Electric discharges, Voltmeters, Electrical corona, *Particle accelerators, *Electrostatic accelerators, Velocity, Vacuum pumps, *Space flight, Algebra, Theory, Space environmental conditions.

A Van de Graaff generator which charges to 600,000 v and delivers 70 microamps when negatively charged and 10 microamps at 475,000 v when positively charged was built. Charge is generated by ionization in the vicinity of the lower pully and transferred from the belt to the oblate by means of ionized air which is due to the potential between belt and oblate. Loss of charge from the belt other than that to the oblate and the maximum surface charge density on the belt were calculated. An equivalent circuit which is a function of belt speed only was obtained and given good agreement with experimental voltage measurements at low belt speeds. An electrostatic particle-accelerator using the Van de Graaff generator was built to accelerate carbonyl-iron spheriods having an average diameter of 3 microns for hypervelocity impact studies. The particles are first charged and then accelerated by the generator. A method for measuring the charge and velocity of the particles is discussed.

AD-257 974 Div. 30, 15
(19 June 61) OTS price $1.60

Cambridge Language Research Unit (Gt. Brit.).
EXPERIMENTAL RESEARCH WORK ON INFORMATION STRUCTURES,
by E. W. Bastin. Annual rept. no. 1, 1 Jan-31 Dec 60. 6 Mar 61, 17p. illus.
(Contract AF 61(052)331)
(AFOSR-855) Unclassified report

DESCRIPTORS: *Computers, Information theory, *Mathematical logic, Calculus of variations, *Programming.

The PACE (Brussels, Belgium) analogue computer equipment is being used to investigate a physical interpretation of a calculus, (namely the calculus defined by the programme of instructions for the computer). The calculus is not completely uninterpreted, but is less interpreted initially than that currently used in physics. In the case under review the calculus is the set of instructions for the PACE equipment set up according to certain rules together with everything the machine turns out, and the interpretative freedom of the model is being used to attack problems that arise at both large and small ends of our measurement scale, and especially in the fundamental questions underlying the physics of elementary particles, where it is acknowledged that classical concepts of space and time break down. (Author)

AD-257 987 Div. 30
(20 June 61) OTS price $2.60

Electronic Systems Lab., Mass. Inst. of Tech. Cambridge.
REAL-TIME ANALOG-DIGITAL COMPUTATION,
by M. E. Connelly. Apr 61, 19p. incl. illus. tables (Technical memo. no. TM-106; Scientific rept. no. 3)
(Contract AF 19(604)6654)
(AFCRL-300) Unclassified report

Reprint of a paper presented at the Analog and Hybrid Computer Techniques Session of the IRE 1961 International Convention in N. Y., March 23, 1961.

DESCRIPTORS: *Computers, Digital computers, Analog computers, Programming, Non-linear differential equations, *Analog to digital converters, Aerodynamics, Costs, *Flight simulators, Training devices.

The relative advantages of analog and digital techniques in simulating complex, nonlinear systems in real-time are discussed. A hybrid configuration is suggested that employs peripheral, high-speed analog elements used on a time-shared basis under the control of the digital program. The use of these analog elements substantially increases the effective computing speed of a given digital computer. Further gains can be made by tailoring the order code and logic of the digital computer to the specific problem class of interest. Programs for function generation and for the aircraft roll equation are presented to illustrate the functioning of the hybrid computer. The hypothesis is presented that a hybrid computer is technically feasible today that would be competitive with analog techniques on the basis of both cost and the ability to simulate natural aircraft frequenices in real-time. Moreover such a computer would offer substantial advantages with respect to accuracy, dynamic range, flexibility, size, power, and reliability. (Author)

AD-257 998 Div. 30
(20 June 61) OTS price $18.00

Armour Research Foundation, Chicago, Ill.
A STUDY OF ROTARY SPEED MEASURING TECHNIQUES,
by V. Z. Viskanta. Feb 60, 1v. incl. illus. 62 refs.
(Contract AF 33(616)6471, Proj. 8224)
(WADD TR 60-210) Unclassified report

DESCRIPTORS: *Rotation, Measurement, *Tachometers, Design, *Transducers, Capacitors, Optical equipment, Digital systems, Radioactivity, Microwave equipment, Acoustics, Pneumatic devices, Tests, Magnetism.

A variety of techniques for measurement of rotary shaft speed have been investigated. Emphasis was placed on the ability of devices to be operable in severe temperature and nuclear radiation environments as may be encountered in propulsion systems and propulsion systems auxiliary apparatus in advanced weapon systems. The study showed that digital transducers (pulse or cycle counting) have advantages over analog since performance of a digital tachometer system is less influenced by changes in transducer parameters. A tachometer using the eddy current principle was devised and evaluated. This technique has many of the advantages of magnetic (variable reluctance) techniques without the upper temperature of operation being limited by the Curie temperature of ferromagnetic materials, since no ferromagnetic materials are used in the device. A capacitance tachometer was designed and evaluated which also has the capability of operating in a high temperature environment. Other techniques, including magnetic, optical, microwave, acoustic, and nuclear were considered and analyzed. The relative merits of the various techniques are discussed and summarized. (Author)

Division 30 - RESEARCH AND RESEARCH EQUIPMENT

AD-258 010 Div. 30, 8
(22 June 61) OTS price $4.60

Sylvania Electric Products, Inc., Waltham, Mass.
R-F SYSTEM ANALYZER, QRC-131 (T),
by D. Newcombe. Final rept. for 8 June-21 Nov 60. 31 Jan 61, 45p. incl. illus. (Rept. no. F482-1)
(Contract AF 30(635)16307)
(RADC TR 61-100) Unclassified report

DESCRIPTORS: *Test sets, Very high frequency, *Radio interference analyzers, Radiofrequency spectrum analyzers, *Antennas, *Transmission lines, High frequency, Standing wave ratios, Noise (Radio), Measurement, Medium frequency, *Video amplifiers, *Radio receivers, Power supplies, *Maintenance equipment, Frequency meters, Radiofrequency oscillators, Noise generators, Modulators, Reliability, Diodes, *Ohmmeters, Radio interference, *Standing wave indicators, *Noise analyzers, Design, Electronic circuits.

A description is given of the electrical and mechanical configurations of the RF system analyzer and how the unit is used to test antennas, transmission lines, and receivers in the frequency range of 0.5 to 250 mc. It is capable of measuring VSWR and termination resistance as well as leakage resistance of transmission lines and their associated antennas. In addition, the system is capable of determining the noise figure of various receivers through the VHF range. It is designed to provide the maintenance technician with a means for rapidly checking the condition of a receiving system without removing the units from their installations. (Author)

AD-258 017 Div. 30, 1, 9
(21 June 61) OTS price $3.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
MINIATURE PIEZOELECTRIC GAGES FOR MEASURING TRANSIENT PRESSURES ON AIRFOILS,
by W. E. Baker and W. O. Ewing, Jr. Mar 61, 33p. incl. illus. tables (BRL memo rept. no. 1329)
Unclassified report

DESCRIPTORS: *Airfoils, Instrumentation, *Aerodynamics, Pressure, Measurement, *Pressure gages, Transients, *Piezoelectric gages, *Rocket propelled sleds, Vibration, Tests, Calibration, Miniature electrical eqipment, Design, Acceleration, Air blast, Shock resistance, Blast, Shock waves.

A description is given of the design, construction, and test of miniature piezoelectric pressure gages for measuring blast-induced transient pressures on the surface of airfoils mounted on rocket sleds. The results of pressure calibrations, vibration testing, and shock tube testing indicate that the gages are very likely suitable for the purpose for which they were designed. (Author)

AD-258 136 Div. 30, 15
(20 June 61) OTS price $8.60

Wolf Research and Development Corp., Boston, Mass.
ADAPTIVE PROGRAM EXPERIMENT I (APE-I),
by Richard P. Gagan and David Klahr. Final rept. 15 May 61, 1v. incl. illus. tables.
(Contract AF 19(604)7308)
(AFCRL-354) Unclassified report

DESCRIPTORS: *Computers, *Data processing systems, *Programming, *Games theory, *Operations research, Control systems, Servomechanisms, Cybernetics.

A detailed description is presented of the investigation of adaption by a data processing machine. The design of the experiment is developed and details of the computer programs are presented. Experimental results are listed in analyzed form and conclusions are drawn regarding adaptive learning in machines. (Author)

AD-258 301 Div. 30, 25
(22 June 61) OTS price $9.60

Laboratoire Mediterraneen de Recherches Thermodynamiques (France).
STUDY OF THE DISTURBANCE CAUSED BY A MOVING BODY IN A PARTIALLY IONIZED GAS,
by F. Marcel Devienne and A. Roustan. Jan 61, 1v. incl. illus. tables.
(Contract AF 61(052)124)
(AFOSR-566) Unclassified report

DESCRIPTORS: *Gas ionization, Superaerodynamics, Gas flow, Measurement, Instrumentation, Vacuum apparatus, Electric discharges, Tests, Test facilities, France.

Contents:
Experimental device
Measurement of ionization rate
Electrical disturbances caused by the passage of the revolving arm
Effects on the duration and relative intensity of the disturbance produced by: the speed of the moving body, the distance of the probes from the arm, the pressure, the profile of the moving body, the shape of the probe, the nature of the gas used
Effect of the ionization rate
Effect of the surface condition of the moving body

AD-258 303 Div. 30, 2
(26 June 61) OTS price $4.60

Air Force Cambridge Research Labs., Bedford, Mass.
AN INVESTIGATION OF SYMBOL CODING FOR WEATHER DATA TRANSMISSION,
by Philip I. Hershberg. Dec 60, 34p. incl. illus. tables, 135 refs. (Air Force Surveys in Geophysics no. 131; AFCRL TN 60-821)
(Proj. 6650)
Unclassified report

DESCRIPTORS: *Weather forecasting, *Data transmission systems, *Coding, Digital systems, Machine translation, Teletype equipment, Analysis.

Results of an investigation of possible binary digital codes for use in transmitting weather messages are presented. Binary codes in general are discussed, and the nature of symbol translations in the presence of single bit communication facility errors is indicated. Also investigated was the variation in symbol occurrence between normal and weather-message English. Symbol probability-of-occurrence data are used to establish code evaluation criteria and to describe the derivation of an optimum code through computer solution. A code indicating an improvement of ten times over Modified Baudot Code, is presented. However, because of the implications involved in possible optimum code instrumentation, this study was limited in scope to codes that could be instrumented with only minor modification to existing facilities. (Author)

31. SHIPS AND MARINE EQUIPMENT

AD-259 239 Div. 31, 13
(23 June 61) OTS price $1.60

RCA Defense Electronic Products, Camden, N. J.
THERMOELECTRIC AIR CONDITIONER FOR SUBMARINES.
Interim Summary rept. 16 Jan 61, 16p. incl. illus. tables.
(Contract NObs-77123)
Unclassified report

DESCRIPTORS: *Thermoelectricity, *Air conditioning equipment, Submarines, Specifications, Design, Tests, Refrigeration systems.

A single-tube subunit of the one-ton model has been constructed and successfully operated for a period of 35 hours. Performance was very close to that predicted in the design. The results established the adequacy of the basic design. All components for the one-ton unit have been fabricated. However, the complete unit has not been assembled because the thermoelectric modules required further work and modifications. The major problem with the thermoelectric modules was marginal-to-unsatisfactory high voltage insulation especially in the presence of moisture. A substantial number of modules have failed under these conditions. It appeared that most of these failures could be attributed to poor quality control of the hard-coated aluminum plates, specifically, insufficient care in making the radii on the edges and otherwise preparing pieces for the hard-coating process. In addition, inadequate protection at the edges from moisture appeared to be a contributing factor. It was felt, however, that the hard-coat insulation scheme adopted was fundamentally adequate and that proper process control would yield satisfactory modules. Several modules have been assembled to evaluate these improvements which consist mainly of minor changes in the structure and configuration, tightening of tolerances, and improved control of the anodizing process. (Author)

32. MISCELLANEOUS ARTS AND SCIENCES

AD-257 939 Div. 32, 18
(21 June 61) OTS price $3.60

Rand Corp., Santa Monica, Calif.
BRITISH PARLIAMENTARY AND PRESS REACTIONS TO THE ABANDONMENT OF THE BLUE STREAK PROGRAM,
by E. W. Schnitzer. 1 Sep 60, 35p. (Research memo. no. RM-2608)
(Contract AF 49(638)700, Proj. Rand)
Unclassified report

DESCRIPTORS: Guided missiles, Political science, Great Britain, Public opinion, Nuclear warfare, Newspapers, Costs, *National defense.

AD-257 964 Div. 32, 28
(19 June 61) OTS price $2.60

Air Force Missile Development Center, Holloman Air Force Base, N. Mex.
A ZOOMETRIC STUDY TO DETERMINE THE OPTIMUM MANUAL PERFORMANCE AREAS FOR THE CHIMPANZEE,
by Lester M. Zinser, William J. Farley and Frederick H. Rohles, Jr. May 61, 25p. incl. illus. table (AFMDC TR 61-150
(Proj. 6893)
Unclassified report

DESCRIPTORS: *Anthropometry, Primates, Human engineering, Tests, *Space flight, Space capsules, Measurement, Design.

Manual work space dimensions were determined for the chimpanzee. The findings can be used as guides in designing space capsules in which performance measures on chimpanzees are required. (Author)

AD-257 973 Div. 32
(19 June 61) OTS price $9.60

Cowles Foundation for Research in Economics, Yale U., New Haven, Conn.
INVESTMENT CRITERIA AND CHOICE OF TECHNIQUES OF PRODUCTION,
by Thirukodikaval N. Srinivasan. Doctoral thesis. 31 May 61, 99p. incl. illus. 14 refs. (Cowles Foundation Discussion paper no. 117)
(Contract Nonr-35801, Proj. NR-047-006)
Unclassified report

DESCRIPTORS: *Economics, *Industrial production, Labor, Money, Sociology, Growth, Machines, Mathematical prediction.

Some important contributions to the problem of choice of investment criteria are reviewed. A simple dynamic model of an economy with two sectors, sector I producing machines and sector II producing a homogeneous consumer good are considered. It was demonstrated that there exists a maximum sustainable rate of consumption per worker for such an economy. This rate is achieved along a terminal path. The terminal path was shown to be a balanced growth path in which the stocks of machines of various types grew at the same geometric rate as the labour force. A time path was derived which minimizes the time taken to reach the terminal path and remain on it thereafter, starting from given initial stocks of various types of machines. Time paths were examined that result from maximizing two specific social welfare functions: (a) consumption per worker at some chosen point of time T in the future and (b) the discounted sum of the future stream of consumption per worker. We concluded that these time paths led to two possible results: (1) consumption per worker declines after a certain point of time, or (2) consumption at some point in time is maximized at the expense of consumption before that point and without any sustainability requirement on consumption beyond that point. Some common characteristics of efficient time paths were established. (Author)

Division 33 - TRANSPORTATION
33. TRANSPORTATION

AD-257 649 Div. 33
(16 June 61) OTS price $4.60

Airborne Instruments Lab., Inc., Mineola, N. Y.
ANALYSES OF THE CAPACITY OF DULLES INTERNATIONAL AIRPORT, THE BRANDT DRIFT-OFF RUNWAY, AND THE MONROE TRIPLE FLOW AIRPORT CONFIGURATION,
by E. N. Hooton, P. H. Stafford, and M. A. Narskow. Feb 61, 1v. incl. illus. tables. (Rept. no. 7601-2)
(Contract FAA/BRD-136; In cooperation with Porter and O'Brien)
Unclassified report

DESCRIPTORS: *Airports, Analysis, Configuration, *Runways.

Analytic models for predicting practical airport capacity have previously been developed and were used to: (1) determine the practical capacity of Dulles International Airport, (2) determine the usefulness of the Brandt Drift-Off feature for increasing airport capacity, and (3) analyze and compare the Monroe Triple Flow Configuration with other configurations. (Author)

AD-257 872 Div. 33, 1, 8
(20 June 61) OTS price $3.60

National Aviation Facilities Experimental Center, Atlantic City, N. J.
CHARACTERISTICS OF A VOR ON A 200-FOOT TOWER,
by Sterling R. Anderson and Robert B. Flint.
Final rept. Apr 60, 7p. illus.
Unclassified report

DESCRIPTORS: *Radio beacons, Very high frequency, Tests, Helical antennas, Loop antennas, Slot antennas, *Air traffic control systems, *Radio towers, Antenna radiation patterns.

A mobile VOR station located in a cleared area 200 feet square at one corner of a heavily wooded site was flight tested. A maximum course scalloping of plus or minus 11.5 degrees was recorded at a radius of 20 mi and an altitude of 1,000 ft. Later, a VOR antenna was erected on a 200-foot tower with a 60-foot-diameter counterpoise. Similar flight tests indicated a scalloping maximum of plus or minus 0.5 degrees. A 20-mile-radius orbital flight in the first null (1.2 degrees) produced scalloping of plus or minus 6 degrees maximum. The distance range, for a receiver input signal of 5 microvolts, varied from 63 mi at 300 ft altitude to 175 mi at 9,000 ft altitude. With an antenna 200 ft above ground, while there still are objectionable course bends in the nulls of the vertical plane radiation pattern, the detrimental effect of the site on VOR performance was reduced at low elevation angles, and the low-altitude coverage was extended. This type of installation should be useful in heavily wooded terrain where a suitable site cannot be obtained for the installation of a more conventional station. (Author)

AD-257 961 Div. 33, 25
(19 June 61) OTS price $11.00

Massachusetts Inst. of Tech., Div. of Industrial Cooperation, Cambridge.
HEAT TRANSFER AT THE AIR-GROUND INTERFACE WITH SPECIAL REFERENCE TO AIRFIELD PAVEMENTS.
Jan 61, 131p. incl. illus. tables, 121 refs.
(Technical rept. no. 63)
(Contract DA 19-016-eng-2743)
Unclassified report

DESCRIPTORS: *Solar energy, *Heat transfer, Air, Earth, Surface temperatures, Runways, Pavements, Soils, *Landing fields, Freezing.

This report presents the results of an investigation of the variables which affect the transfer of heat at the air-ground interface. Emphasis is placed on freeze and thaw penetration beneath airfield pavements, although the analyses presented are valid for any ground surface. The investigation demonstrates that certain readily obtainable measurements may be utilized to predict the amounts of heat flow at the ground surface due to various atmospheric phenomena. Methods used to develop charts and diagrams for the convenient programming of a hydraulic analog computer are presented. (Author)

NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

* Descriptors marked with an asterisk will be included in the cumulative indexes.

BEHAVIORAL SCIENCES

PB 171 109 $5.00

Institute for Applied Experimental Psychology, Tufts U., Medford, Mass.
HUMAN ENGINEERING BIBLIOGRAPHY 1958-1959. Rept. on Contract Nonr-494(13). Oct 60, 406p. 1825 refs. ONR rept. ACR-55.

DESCRIPTORS: *Human engineering, Bibliography

Personnel and Training

PB 150 233 $5.60

Human Factors Research, Inc., Los Angeles, Calif.
A STUDY OF FACTORS INFLUENCING THE JUDGMENT OF HUMAN PERFORMANCE, by William Harris and Donald N. Buckner. Technical rept. no. 1 on Contract Nonr-1241(00). 18 Aug 60, 56p. 14 refs. AD-242 405.

DESCRIPTORS: *Reasoning, *Attitudes, Test methods, Statistical analysis, Naval personnel, Reliability, Behavior.

Raters tend to perceive, or at least judge, stimuli to be farther apart when they represent performance than when they are simply stimuli; that is, they tend to be more discriminating when judging the performance of others than when making psychophysical judgments. The results emphasized the necessity for studying the influence of rater-performer interactions and individual rater differences upon judgments of performance. The differential results of brief experience on the task observed in the two studies seemed to be primarily a function of the different attitudes toward the performers being judged. Also, the results of the reliability analysis suggested that individual raters differed considerably in their perception of the performance judgment task--as opposed to the objective judgment task--perhaps because of different attitudes toward performers in general (e.g., relative leniency) or attitudes toward the particular group of performers. (Author)

PB 156 350 $8.60

Human Resources Research Office, George Washington U., Washington, D. C.
SURVEY OF THE EDUCATIONAL PROGRAM OF THE ARTILLERY SCHOOL, ANTIAIRCRAFT AND GUIDED MISSILES BRANCH, FORT BLISS, TEXAS. REPORT AND RECOMMENDATIONS BY A SPECIAL SURVEY COMMISSION. Dec 52, declassified, 96p. HumRRO Special rept. no. 1; AD-2314.

This report released for sale to the public 28 June 61.

DESCRIPTORS: *Antiaircraft gunnery, *Guided missile personnel, Training, *Military training

The survey team evaluated: (1) methods of instruction; (2) organization of course content with a view toward possible reduction in the length of courses; and (3) methods used in determining student progress and proficiency. They were also concerned with identifying problems that would necessitate experimental research. Recommendations are made concerning the following: organization and administration; curricula, instruction, and instructional aids; the grading and evaluation system; the student body; and the Officer Candidate School.

Psychology

PB 155 460 $2.60

Bureau of Social Science Research, Inc., Washington, D. C.
THE RELEVANCE FOR THE SOCIAL SCIENCES OF KNOWLEDGE DERIVED FROM STUDIES OF STRESSFUL CAPTIVITY, by Albert D. Biderman and Edgar H. Schein. Rept. on Contract AF 49(638)727. Mar 61, 27p. 3 refs. BSSR Research rept. 339-2; AFOSR-454; AD-253 365.

DESCRIPTORS: *War prisoners, *Psychology, *Stress (Psychology), *Social sciences, Adjustment (Psychology), *Behavior.

This report presents an outline of topics treated in works on stressful captivity that are relevant to the social sciences. The outline has been employed in a larger work (in preparation) which attempts to analyze and integrate the present and potential contributions of studies of stressful captivity situations to social science knowledge. The focus is on studies of American prisoners during the Korean War. These studies are considered in relation to reports of other prisoner-of-war, concentration camp, and political prisoner experiences. (Author)

PB 155 316 $4.60

Bureau of Social Science Research, Inc., Washington, D. C.
A SELECTED BIBLIOGRAPHY ON CAPTIVITY BEHAVIOR, by Albert D. Biderman, Barbara S. Heller, and Paula Epstein. Rept. on Contract AF 49(638)727. Feb 61, 50p. 630 refs. BSSR Research rept. 339-1; AFOSR-295; AD-253 964.

DESCRIPTORS: *Bibliography, *War prisoners, Enemy personnel, *Behavior, Reasoning, Inhibition, *Stress (Psychology).

This bibliography lists titles reviewed during a study of the implications for the social sciences of knowledge developed in studies of prisoners of war, political prisoners, concentration camp prisoners, and civilian internees. The bibliography attempts comprehensive coverage of scientific and scholarly material relating to Americans captured during the Korean War, and of other events since 1940. Significant studies of earlier events and illustrative autobiographical, journalistic, and propagandistic accounts are also listed. (Author)

PB 150 947 $1.10

Georgetown U. Medical School, Washington, D. C.
THE FORGOTTEN FIELD OF PERSONALITY RESEARCH: THE CHARACTER AND BEHAVIOR DISORDERS, by John H. Rohrer. Rept. on Contract Nonr-1530(07). Aug 60, 8p. AD-244 314.

DESCRIPTORS: *Personality, *Behavior, *Adjustment (Psychology), *Psychoneuroses, Sociology.

Although the symptoms and social consequences of personality and behavior or character disorders have been dealt with in research, little work has been done in analyzing the basic psychodynamic factors that produce the symptoms. This study is based on two assumptions: (1) these disorders represent patterns of behavior that are lawful in nature; and (2) these are socially learned patterns of behavior and are developed in order to protect, gratify, and enhance the psychological integrity of the individual. It was felt that by systematic examination of the family-provided socialization experiences of an experimental and control group, one might be able to identify the independent variables that produce the symptoms. Questionnaires of 240 Navy recruits diagnosed as having character and personality disorders were compared with two random samples of individuals who had completed boot camp successfully. Noting that a far greater number of disorders occurred in families of the lower class than occurred in middle class families, it was decided to study an experimental and control group of lower class families. The following variables were significant in the production of the character and personality disorders: (1) a rejecting mother, (2) an over-protective mother; (3) an inadequate father; (4) a minimal amount of role experimentation; (5) an excessive number of failures in role experimentations attempted; (6) a seeking out of an ego ideal among the peer group in which the child finds himself (the gang); and (7) no consistent way used by the parents of providing the child or adolescent with money for normal activities that children engage in.

PB 156 576 $3.60

Interaction Lab., Yale U., New Haven, Conn.
COMPLETENESS THEOREMS FOR THE SYSTEMS E OF ENTAILMENT AND EQ OF ENTAILMENT WITH QUANTIFICATION, by Alan Ross Anderson and Nuel D. Belnap, Jr. Technical rept. no. 6 on Problem Solving and Social Interaction, Contract SAR/Nonr-609(16). Nov 59, 35p. 11 refs. AD-239 385.

This report released for sale to the public 30 June 61.

DESCRIPTORS: *Group dynamics, Sociology, *Mathematical logic.

The concept of implication or entailment is investigated to provide an alternative way of considering the notion of relevance and to show that A $\rightarrow$ B is provable in the system E(J. of Symbolic Logic, 23:457-458, 1958) just in case A depends on the content of B. These results are extended to a system of quantification theory, with E as the underlying propositional logic. (See also AD-159 634)

PB 156 575 $9.60

Interaction Lab., Yale U., New Haven, Conn.
A FORMAL ANALYSIS OF ENTAILMENT, by Nuel D. Belnap, Jr. Technical rept. no. 7 on Problem Solving and Social Interaction, Contract SAR/Nonr-609(16). June 60, 118p. 81 refs. AD-239 386.

This report released for sale to the public 30 June 61.

DESCRIPTORS: *Group dynamics, Sociology, *Mathematical logic.

Contents:
Description and criticism
Requirements on a formal theory of entailment
Ackermann's systems
Previous attempts to formalize entailment
Construction: the theory of entailment
The pure theory of entailment
Entailment and modality
The complete theory of entailment
Variants on the system E

PB 155 812 $1.60

Washington State U., Pullman.
STUDIES OF SHORT TERM RETENTION: II. RECALL AS A FUNCTION OF ITEM FREQUENCY, by Kenneth E. Lloyd and William A. Johnston. Rept. on Contract AF 49(638)805. Dec 60, 14p. 5 refs. Research rept. WSU-2; AFOSR-299; AD-254 811.

DESCRIPTORS: *Memory, Test methods, *Verbal behavior, Conditioned reflex, Statistical analysis, Reaction (Psychology).

Short term retention was studied in a situation requiring subjects to remember familiar letter-word pairs until their recall was requested. During the time the subjects were required to remember these items they were presented other items or asked to recall previously presented items. The major independent variable investigated was the frequency of occurrence of the items that were presented to the subjects. A second independent variable was the average number of items being remembered at the time of a requested recall. The average number of letter-word pairs that the subjects were required to remember was 3.5 and 6.5. Recall errors were found to decrease with an increase in the range of item frequency variation, and to increase with an increase in the average number of items the subjects were remembering. An examination of percent recall scores for the items which occurred with different frequencies indicated that the improvement in recall for the high range group was partly due

to greater recall of high frequency items and partly due to greater recall of low frequency items. That is, the high range group tended to exceed the low range group at all frequency values. (Author) (See also PB 153 403)

PB 155 813 $1.60

Washington State U., Pullman.
STUDIES OF SHORT TERM RETENTION: III. RECALL AS A FUNCTION OF VERBAL CONTEXT, by William A. Johnston and Kenneth E. Lloyd. Rept. on Contract AF 49(638)805. Dec 60, 13p. 8 refs. Research rept. WSU-3; AFOSR-73; AD-254 810.

DESCRIPTORS: *Memory, Test methods, Verbal behavior, Conditioned reflex, Statistical analysis, Reaction (Psychology).

The three variables examined in the present study were verbal context, word order (response order and stimulus order), and average storage load. It was hypothesized that the relationship between verbal context and correct recall would be negative in the stimulus order condition and positive in the response order condition. When verbal context was high, performance was expected to differ significantly between the stimulus order and response order conditions. Furthermore, recall was expected to vary directly with average storage load Word passages which varied in order of approximation to the English sentence (zero, second, fourth, and eighth orders) were obtained for this study. Verbal context increased as the passages varied from the zero to the eighth order. Eight sequences of items (letter-word pairs) and recall points (letters alone) were prepared for each of the two word order conditions. Each sequence was subdivided into eight subsequences. A subsequence was composed of 20 items and 10 recall points. The subsequences varied with respect to verbal context and average storage load (3.0 and 7.0 words). Twelve subjects responded to sequences in the stimulus order condition, and 12 subjects responded to sequences in the response order condition. Each subject participated 45 minutes a day for four successive days. The results indicated that verbal context was positively related to recall in the response order group but had no influence on performance in the stimulus order group. The two groups differed significantly at the fourth and eighth orders of approximation. The greatest share of recall variation was due to variation in average storage load. (See also PB 155 812)

BIOLOGICAL SCIENCES

PB 155 708 $1.60

Henry Ford Hospital [Detroit, Mich.]
ATTEMPT TO ESTABLISH A LABORATORY TEST OBJECT FOR THE GROWTH AND DETECTION OF THE HEPATITIS VIRUS, by Gerald A. LoGrippo, Raymond Shougher and others. Final rept. 1 Apr 59-31 Jan 60, on Contract DA 49-007-MD-792. [1960] 13p; AD-233 669.

DESCRIPTORS: *Hepatitis virus, Growth, Detection, Serum, Enzymes, Tissues (Biology), Culture media, Collagen.

Contents:
The influence of abnormal levels of serum enzymes from hepatitis patients upon biological systems
The effect of serum enzymes upon the D-6 cells in tissue culture
The effect of serum enzymes upon haemagglutination technics
Continued attempts to adapt the hepatitis virus as a laboratory test object in tissue culture
Sources of clinical specimens
Liver tissue cells cultured in collagen matrix
Other human tissues grown on rat tail collagen matrix
Tissue implantation on chorioallantoic membrane of chick embryos.

OTS SB-455 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
BIO-ASTRONAUTICS. Mar 61, 12p. 160 refs. OTS Selective Bibliography SB-455.

DESCRIPTORS: *Astronautics, *Physiology, Instrumentation, *Bibliography, *Space medicine.

This bibliography lists reports and translations placed in the OTS collection between Jan 59 and Apr 61 on the human aspects of space flight: physiological effects, and instrumentation and environmental requirements. A separate section lists bibliographies, dictionaries and surveys in this field.

Anatomy and Physiology

PB 155 536 $1.10

Brain Research Inst., Psychiatric University Clinic (Switzerland).
TECHNICAL FINAL REPORT NO. 12, by E. Grünthal. Rept. for 1 Oct-31 Dec 60 on Contract AF 61(052)30. 31 Dec 60, 3p. 25 refs. AFOSR-287; AD-253 745.

DESCRIPTORS: *Brain, Animals, Physiology, Nervous system, Anatomy, Histology, Rodents.

A study was made of the anatomy of the beaver brain and of related rodents from the viewpoint of relating functional anatomy to neurophysiological and behavioral observations. The microscopic studies of the following were continued: (1) the limbic system, i.e. cingulum, septal region, hippocampus, amygdala; etc;, and (2) bulbus olfactorius and lobus pyriformis. Comparative studies were continued of the histology as well as the gross anatomy of the brain of other highly developed rodents. The preparation of stereotactic g guides for neurophysiological experimentation was initiated.

PB 155 527 $2.60

Istituto Nazionale di Ottica, Florence (Italy)
BASIC RESEARCH IN THE FIELD OF VISION, by A. Fiorentini, L. Ronchi Rositani and others. Annual summary rept. no. 1 on Contract AF 61(052)80. 28p. 10 refs. AFOSR-235; AD-251 238.

DESCRIPTORS: *Vision, Optical images, Visibility, Stability, *Retina, Motion, Illumination, *Visual perception, *Eye, *Visual acuity, Vibration, Focusing, *Visual thresholds, Radar operators, *Photoreceptors, Test methods, *Color vision, Display systems

The results are summarized of various investigations on some basic characteristics of vision. The subjects

of the investigations are the following: (1) disappearance of a stabilized image with intermittent illumination; (2) influence of a vibrating movement on the vision of an image with fuzzy contours; (3) some methods for improving the perception of signals in extrafoveal vision; (4) is the pulsating illumination actually advantageous, in practice, with respect to steady illumination; (5) blue-green interaction at mesopic levels; (6) blue-green electroretinographic responses; and (7) the perception of size in ambients of different color and by correcting the chromatic aberration of the eye. (Author)

PB 156 326 $8.10

Naval School of Aviation Medicine, Pensacola, Fla.
DISORIENTATION: A CAUSE OF PILOT ERROR, by Brant Clark (San Jose State Coll.) and Ashton Graybiel. 2 Mar 55, 89p. 72 refs. Research rept. no. NM 001 110 100.39.

This report released for sale to the public 28 June 61.

DESCRIPTORS: *Vertigo, Aviation safety, Pilots, Physiology, Space perception, Visual perception, Errors.

This report which is written primarily for flight surgeons summarizes and organizes a large number of studies bearing on disorientation (vertigo) in aircraft pilots. It is organized in terms of the perceptual processes which lead to proper orientation and disorientation in flight and attempts to show their relation to the pilot's task. Disorientation in flight is considered to be due to psychophysiological causes which should be regarded as the inevitable consequence of placing man in a task for which he is not fitted either by endowment or past training. An attempt is made to present explanations of pilots' experiences with disorientation in psychophysiological terms. Some suggestions are made to prevent disorientation and to deal with it when it does occur.

General Biology

TID-3908 $3.00

Atomic Energy Commission. Div. of Biology and Medicine, Washington, D. C.
AN ANNOTATED BIBLIOGRAPHY ON THE USES O STATISTICS IN ECOLOGY-A SEARCH OF 31 PERIODICALS, by V. Schultz. 1961, 319p.

TID-12439 $1.00

Atomic Energy Commission. Div. of Biology and Medicine, Washington, D. C.
BIOENVIRONMENTAL FEATURES OF THE OGOTORUK CREEK AREA, CAPE THOMPSON, ALASKA. A first summary by the Committee on Environmental Studies for Project Chariot. Dec 60, 75p

Radiobiology

TID-3909 $1.75

Atomic Energy Commission. Div. of Biology and Medicine, Washington, D. C.
AN ATOMIC RADIATION BIBLIOGRAPHY, comp. by A. W. Klement, Jr. A list of reports submitted to the United Nations Scientific Committee on the Effects of Atomic Radiation. 1 Mar 61, 73p.

UCRL-9617 $2.25

Lawrence Radiation Lab., U. of California, Berkeley.
BIOLOGY AND MEDICINE, ed. by J. H. Lawrence and A. Pfau. Semiannual rept. Spring 1961 on Contract W-7405-eng-48. Mar 61, 108p.

PB 156 650 $2.60

Naval Radiological Defense Lab., San Francisco, Calif.
ANALYTICAL PROCEDURES AT THE U. S. NAVAL RADIOLOGICAL DEFENSE LABORATORY FOR THE DETERMINATION OF CERTAIN RADIOELEMENTS IN URINE, by W. H. Shipman and H. V. Weiss. 7 July 60, 28p. 9 refs. Research and development technical rept. USNRDL-TR-451; AD-246 583.

This report released for sale to the public 30 June 61.

DESCRIPTORS: *Urine, *Radioactive isotopes, *Radioactivation analysis, Barium, Strontium, Plutonium, Polonium, Radium, Uranium.

Analytical procedures are described for the determination of the following radioactivities in urine: gross beta activity, barium-140, strontium-90, plutonium, polonium, radium, and natural uranium. (Author)

NYO-9205 $2.75

Radiological Research Lab., Columbia U., New York, N. Y.
RESEARCH PROJECT. Annual rept. on Contract AT-30-1-GEN-70. 1 July 60, 161p.

PB 156 319 $10.50

USAF Radiation Lab., U. of Chicago, Ill.
QUARTERLY PROGRESS REPORT NO. 34, by Kenneth P. DuBois. Rept. on Contract AF 41(657)252. 15 Jan 60, 136p. 81 refs.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Radiation injuries, *Tissues (Biology), Biochemistry, Pharmacology, Toxicity, Therapy, *X-rays, Serotonin, Thiourea, Gamma rays, Radiochemistry.

Contents:
Pharmacological and toxicological compounds as protective or therapeutic agents against radiation injury in experimental animals
The influence of exposure to low levels of gamma and fast neutron irradiation on the life span of mice
The effects of ionizing radiations on the biochemistry of mammalian tissues

CHEMISTRY

UCRL-9566 $4.50

Lawrence Radiation Lab., U. of California, Berkeley.
CHEMISTRY DIVISION. Annual rept. 1960 on Contract W-7405-eng-48. Feb 61, 331p.

MLM-1101 Tr. $1.75

Mound Lab., Miamisburg, Ohio.
PROTACTINIUM, by M. Haissinsky and G. Bouissieres. Atomic Energy Commission Research and Development rept. on Contract AT-33-1-GEN-53. 72p.

ORNL-3012 $0.75

Oak Ridge National Lab., Tenn.
DIRECT REDUCTION OF URANIUM HEXAFLUORIDE TO URANIUM METAL BY SODIUM (DRUHM PROCESS), by C. D. Scott. Rept. on Contract W-7405-eng-26. 25p.

ORNL-2855 $0.50

Oak Ridge National Lab., Tenn.
LABORATORY DEVELOPMENT OF A TRIBUTYL PHOSPHATE SOLVENT EXTRACTION PROCESS FOR PROCESSING 20% ENRICHED URANIUM ALLOY FUEL, by J. H. Goode and J. R. Flanary. Rept. on Contract W-7405-eng-26. 24p.

ORNL-3019 $0.50

Oak Ridge National Lab., Tenn.
AN OXYHYDROCHLORINATION PROCESS FOR PREPARING URANIUM-MOLYBDENUM REACTOR FUELS FOR SOLVENT EXTRACTION: LABORATORY DEVELOPMENT, by T. A. Gens. Rept. on Contract W-7405-eng-26. 21p.

ORNL-3092 $1.50

Oak Ridge National Lab., Tenn.
STUDY OF CAUSES AND PREVENTION OF HARD CAKE FORMATION DURING OUT-OF-PILE CIRCULATION OF AQUEOUS THORIUM OXIDE SLURRIES, by C. S. Morgan. Rept. on Contract W-7405-eng-26. 54p.

Analytical Chemistry

PB 156 644 $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
THE DETERMINATION OF THE OXIDATION STATES OF URANIUM NEPTUNIUM AND PLUTONIUM IN AQUEOUS MEDIA, by S. C. Foti and E. C. Freiling. 8 July 60, 20p. 19 refs. Research and development technical rept. USNRDL-TR-444; AD-243 197.

This report released for sale to the public 3 July 61.

DESCRIPTORS: *Uranium, *Neptunium, *Plutonium, Oxidation, Distribution, *Tracer studies, Water, Sea water, Actinium series, Quantitative analysis, Acetones, Sodium compounds, Solvent extraction, Chlorides, Solutions, Fluorides.

The Problem: A knowledge of the distributions of uranium, neptunium and plutonium among their respective oxidation states in various aqueous media is important to problems of contamination, heavy element recovery, and physical chemistry. Spectrophotometric methods, and other methods which utilize macroscopic properties of the elements to determine their oxidation state distributions, are inapplicable at tracer concentrations. It therefore became necessary to develop chemical separation methods to bring about the desired analyses. The Findings: It has been found that actinide elements in the plus four oxidation state are nearly quantitatively extracted by 0.4 M 2-thenoyltrifluoroacetone (TTA) from 0.5 N hydrochloric acid. After adjusting the pH of the raffinate to 4.3 with ammonium acetate, a second extraction removes plutonium (III). A lanthanum fluoride precipitation, carried out on a second sample of solution, carries all oxidation states but the six. Radiochemical analysis of the separated fractions can then be used to determine the oxidation state distributions. (Author)

TID-7606 $4.25

Oak Ridge National Lab., Tenn.
ANALYTICAL CHEMISTRY IN NUCLEAR REACTOR TECHNOLOGY. Fourth Conference, Gatlinburg, Tennessee, October 12-14, 1960. 433p.

IDO-14547 $2.75

Phillips Petroleum Co., Idaho Falls.
ICPP ANALYTICAL SECTION, ed. by R. C. Shank. Annual rept. 1960 on Contract Contract AT(10-1)-205. 14 Apr 61, 174p.

DP-571 $0.50

Savannah River Lab., Aiken, S. C.
IDENTIFICATION OF HYDROCARBON TYPES IN "ULTRASENE", by R. N. Wilhite. Rept on Contract AT(07-2)-1. Apr 61, 12p.

K-1476 $0.75

Union Carbide Nuclear Co., Oak Ridge, Tenn.
GRAVIMETRIC FACTORS FOR URANIUM IN SELECTED COMPOUNDS, by W. D. McCluen and F. H. Anderson. Rept. on Contract W-7405-eng-26. 15 June 61, 29p.

Organic Chemistry

PB 156 580 $2.60

Aeronautical Research Lab. [Air Force Research Div.] Wright-Patterson AFB, Ohio.
SYNTHESIS, PROPERTIES AND COMPLEX FORMATION OF FLUORINATED COMPOUNDS, by Jack Radell and Joseph W. Connolly. Mar 59, 25p. 20 refs. WADC Technical rept. 59-118; AD-211 656.

This report released for sale to the public 30 June 61.

DESCRIPTORS: Esters, Fluorination, *Fluorides, Synthesis, Chemical properties, *Clathrate compounds, Molecular structure.

Urea inclusion compounds of several fluorinated esters have been prepared. The effect of fluorine on the ability of these esters to form urea complexes was contingent on whether the fluorine was present in the alkyl or acyl moiety of the ester. The most significant contribution of fluorine to urea inclusion compound formation was found to be steric and not polar. Information on the minimum anchor length required for urea inclusion compound formation of the fluorinated esters was used for conformational analysis of a urea included ester. Twenty-seven of the thirty-one fluorinated compounds prepared for the study have not been previously reported. A proposed simplified planar zigzag projection formula describes and illustrates the conformation of the molecules trapped in the urea inclusion compound compound. (Author)

AD-255 096 repriced $1.00

Leicester U. (Gt. Brit.)
ARYLSILANES AND AROMATIC REACTIVITY [AND] CHEMISTRY OF ORGANOGERMANIUM COMPOUNDS, by J. A. Sperry and T. W. Swaddle. Final technical status rept. 1 Jan 58-31 Dec 60, on Contract DA 91-591-EUC-1024. [1961] 39p. 58 refs.

DESCRIPTORS: *Silanes, *Methyl radicals, Chemical reactions, Synthesis, *Organic compounds, *Germanium compounds, Chemistry.

Aryltrimethylsilanes were prepared, including derivatives of furan, benzothiophene, dibenzofuran, dibenzothiophen, N-ethylcarbazole, diphenyl ether, diphenyl sulphide, fluorene, diphenylmethane, pyrene anthracene, phenanthrene, and dihydrophenathene. The rates of cleavage of the aryltrimethylsilanes by aqueous methanolic perchloric acid was measured spectrophotometrically. A preliminary study of the comparative reactivities of some C-Ge, C-Si, and C-Sn bonds is reported. Benzylgermanium bonds are shown to be cleaved much less readily by aqueous ethanolic alkali than are analogous benzyl-silicon bonds, while the latter are less readily cleaved than benzyl-tin bonds. (Author)

Physical Chemistry

NAA-SR-6094 $0.50

Atomics International, Canoga Park, Calif.
SODIUM-GRAPHITE INTERACTION AND GRAPHITE PROTECTIVE COATINGS, by J. J. Gill. Rept. on Contract AT(11-1)-GEN-8. 1 May 61, 22p.

NAA-SR-6087 $0.50

Atomics International, Canoga Park, Calif.
THEORY OF THE SURFACE TENSION OF MOLTEN SALTS, by H. Reiss and S. W. Mayer. Rept. on Contract AT(11-1)-GEN-8. 1 May 61, 11p.

PB 155 198 $1.60

California U., Berkeley.
THE INFRARED SPECTRUM OF SOLID CARBON MONOXIDE, by George E. Ewing and George C. Pimentel. Rept. on Contract AF 49(638)1. 1 Feb 61, 20p. 27 refs. AFOSR-242; AD-254 304.

DESCRIPTORS: Carbon compounds, *Monoxides, *Infrared spectroscopy, *Solidified gases, Molecular rotation, Isotopes, Vibration, Lattices, Crystal structure.

The infrared spectrum of solid carbon monoxide at 20°K has been examined in the fundamental and overtone regions. Sharp features (band widths about one cm^{-1}) are assigned to vibrational modes of the various isotopic species: $C^{12}O^{16}$, 2138.1 cm^{-1}; $C^{12}O^{17}$, 2112.3 cm^{-1}; $C^{13}O^{16}$, 2092.2 cm^{-1}; and $C^{12}O^{18}$, 2088.4 cm^{-1}. These frequencies are examined with the aid of existing theories of frequency shifts in condensed phases. A broad absorption (band width about 40 cm^{-1}) centered at 2208 cm^{-1} is assigned to combinations of the fundamental mode with lattice modes. Calculations suggest that the lattice modes involved probably include translations as well as librations. (Author)

HW-68380 $0.50

Hanford Atomic Products Operation, Richland, Wash.
REACTIONS OF GRAPHITE WITH MICROWAVE-ACTIVATED NITROGEN, by R. C. Giberson. Preliminary rept. on Contract AT(45-1)-1350. Feb 61, 11p.

PB 155 691 $2.60

Hull U. (Gt. Brit.).
A PRELIMINARY STUDY OF THE WATER-CATALYSED OXIDATION OF CARBON MONOXIDE, by R. R. Baldwin, D. Booth, and C. T. Brooks. Technical note no. 2 on Contract AF 61(052)62. Oct 60, 26p. 16 refs. AFOSR TN-60-1348; AD-254 326.

DESCRIPTORS: Carbon compounds, *Monoxides, *Oxidation, Water, Catalysis, Chemical reactions

The oxidation of moist CO mixtures has been studied in HNO_3- and HF-washed pyrex, HNO_3-washed silica, and fresh and aged boric-acid-coated vessels. The reaction is highly reproducible in aged boric-acid-coated vessels, and a detailed study of the slow reaction and second limit has been made. (Author)

PB 155 057 $1.60

Illinois U. (Urbana).
THE MASS SPECTRUM OF ETHYL-LITHIUM VAPOR, by Theodore L. Brown, J. Berkowitz (Argonne National Labs.) and D. A. Bafus. Rept. on Contract AF 49(638)466. 26 Jan 61, 14p. 21 refs. AFOSR-220; AD-253 804.

DESCRIPTORS: *Mass spectroscopy, Vapors, *Lithium compounds, *Ethyl radicals, Ions, Metalorganic compounds.

The mass spectrometric results for ethyl lithium show that the saturated vapor consists predominantly of a hexamer and a tetramer in roughly equal concentrations at 80° - 95° C. suggesting a ring structure, rather than a linear configuration.

PB 155 623 $1.10

Indiana U., Bloomington.
NOTES ON THE RATE OF GAS PHASE REACTIONS OF NH_2 FREE RADICALS, by Maurice H. Hanes and Edward J. Bair. Rept. on Contract AF 49(603)93. 28 Feb 61, 5p. 4 refs. AFOSR-355; AD-253 825.

DESCRIPTORS: *Free radicals, *Amines, Gases, Phase studies, *Chemical reactions, Reaction kinetics.

The reaction of NH_2 radicals following an individual RF discharge pulse through ammonia was investigated using multiple flash apparatus. The apparatus was extended to give a sequence of ten 5-joule flashes through a quartz capillary of 1.5-mm diam and 5 mm long at crystal-controlled intervals from 0.2 to 2.0 msec. The maximum initial NH_2 concentration was not strongly dependent on the ammonia pressure. No NH radicals were detected although they are readily observed following a discharge through a mixture of H and N. The fluorescence which accompanied the discharge decayed to an undetectable level in less than 5 microsecond after the discharge. The assumption was made that the resultant process of the discharge can be represented by the equation NH_3 yields $NH_2 + H$. The average initial rate was second order with respect to NH_2.

PB 155 135 $8.10

Institute de Quimica Fisica (Spain).
KINETICS AND MECHANISM OF THE DEHYDROGENATION OF ISOPROPYL ALCOHOL ON Cr_2O_3 AND $ZnCr_2O_4$, by Juan F. Garcia de la Banda and G. Kremenic Orlandini. Final rept. on Contract AF 61(514)1330. Dec 60, 86p. 85 refs. AFOSR-168; AD-252 344.

DESCRIPTORS: *Reaction kinetics, *Dehydrogenation, *Propanols, Chromium compounds, Oxides, Zinc compounds, Chromates, Catalysts, Catalysis, Temperature, Resistance, Semiconductors, Alcohols.

The kinetics of isopropyl alcohol dehydrogenation on Cr_2O_3 and $ZnCr_2O_4$ catalysts have been studied at several temperatures in the 350 - 500°C range. The apparent reaction mechanism seems to be the same on both catalysts. It includes two equal active centers on which reactant and products obtained are adsorbed. The surface reaction is the reaction rate determining step. It appears that during the reaction both Cr_2O_3 and $ZnCr_2O_4$ are subjected to a p→n inversion in their semi-conductivity type. This promotes abnormal kinetic effects. For Cr_2O_3 p→n inversion has been substantiated by electrical resistance measurements in different atmospheres and in the course of the reaction. (Author)

KAPL-2149 $0.50

Knolls Atomic Power Lab., Schenectady, N. Y.
HYDROGEN ABSORPTION BY ZIRCONIUM - 2 at. % TIN - 2 at. % NIOBIUM ALLOY DURING CORROSION, by H. A. Fisch. Rept. on Contract W-31-109-eng-52. 19 Jan 61, 16p.

PB 155 697 $5.60

Louvain U. (Belgium).
NEW DEVELOPMENTS OF A KINETICAL STUDY OF FLAMES, by A. Van Tiggelen. Technical note no. 3 on Contract AF 61(514)1245. Feb 61, 59p. 8 refs. AFOSR TN-60-1210; AD-254 500.

DESCRIPTORS: *Flames, *Reaction kinetics, *Flame propagation, Methanes, Nitrogen compounds, Oxides, Ethylenes, Oxygen, Vinyl chlorides, Fuels, Oxidizers

Two developments of the theory of flame propagation are presented; they concern first the order with respect to fuel and oxidizer of the branching process in the flame and secondly the problem of flames propagating in ternary mixtures (two fuels and one oxidizer). Flames propagating in methane—nitrous oxide mixtures have been investigated. These flames do not behave in the same manner as the more classical flames : the reaction order is one with respect to fuel and also one to oxidizer. This means that a total order is observed here which is one unit higher than for the methane-oxygen flames. The properties of the flames sustained by ternary mixtures of ethylene, vinylchloride and oxygen have been studied. The activation energy of the branching process calculated from the experimental data, varies continuously from the value found for pure ethylene-oxygen flames to the value observed for pure vinylchloride-oxygen flames while the fraction of vinylchloride content varies from zero to unity. However this variation is not exactly what should be expected in the absence of some inhibition effect due to the presence of the halogen. (Author)

PB 155 557 $1.60

Mallinckrodt Chemical Lab., Harvard U., Cambridge, Mass.
CHEMISTRY OF THE METAL CARBONYLS. XIV. FLUOROCARBON DERIVATIVES OF IRON CARBONYL, by R. B. King, S. L. Stafford and others. Rept. on Contract AF 49(638)518. Mar 61, 20p. 29 refs. AFOSR-397; AD-253 821.

DESCRIPTORS: *Metalorganic compounds, Vinyl radicals, *Fluorides, Fluorine, Carbonyl radicals, *Nuclear magnetic resonance, Metallic compounds, Metals, Fluorocarbons, Molecular structure, *Hyperfine structure, Chemical properties, Iodides, Synthesis.

Perfluoroalkyl iodides react with iron pentacarbonyl at moderate temperatures to afford perfluoroalkyliron tetracarbonyl iodides, as well as lesser amounts of dimeric perfluoroalkyliron tricarbonyl iodides. Treatment of triiron dodecacarbonyl with sodium amalgam of dispersion in tetrahydrofuran gives brown solutions which react with perfluoroacyl chlorides to yield bis(perfluoroalkyl) iron tetracarbonyl compounds. (Author)

PB 155 833 $2.60

Mellon Inst., Pittsburgh, Pa.
INFRARED SPECTROSCOPIC STUDY OF THE PHOTOLYSIS OF METHYL AZIDE AND METHYL-d_3 AZIDE IN SOLID ARGON AND CARBON DIOXIDE, by Dolphus E. Milligan. Rept. on Contract AF 49(638)542. 22 Mar 61, 30p. 11 refs. AFOSR-533; AD-254 844.

DESCRIPTORS: Denterated compounds, *Azides, Methyl radicals, Argon, Solids, Photolysis, Gases, *Photochemical reactions, Imines, Low temperature research, Decomposition, Spectrographic analysis, Carbon dioxide, Infrared spectroscopy, Methanes, Polymers, Test equipment.

Experiments have been carried out on the photolysis of methyl azide and methyl-d_3 azide at high dilution in solid argon (4.2 K) and carbon dioxide (about 50 K). Photolysis of these species in argon and carbon dioxide matrices results in the appearance of a number of new spectral features in the 1/3300-1/600 cm region. The spectroscopic data for the photolysis products appear to be consistent with the identification of these species as methyleneimine (CH_2:NH) and methyleneimine-d_3 (CD_2:ND). (Author)

PB 155 690 $1.60

Oxford U. (Gt. Brit.)
EMISSION SPECTRA OF FLAMES SUPPORTED BY ACTIVE NITROGEN, by K. R. Jennings and J. W. Linnett. Rept. on Contract AF 61(514)1117. Dec 60, 12p. 19 refs. AFOSR-TN-60-1017; AD-254 361.

DESCRIPTORS: *Flames, Ultraviolet spectroscopy, Spectrographic analysis, *Hydrocarbons, Combustion, Nitrogen, Cyanogen.

Visible and ultra-violet emission spectra of flames produced by introducing sixteen substances into a stream of active nitrogen have been photographed. The CN Red and Violet systems are the most prominent features of the spectra of flames given by hydrocarbons, and although the CH 4315Å head is present, the CH 3889A head is not observed. A complex group of heads in the region of 3290Å was also observed in the spectrum of hydrocarbon flames and this has been tentatively assigned to the cyanogen molecule or to a species formed from it. (Author)

PB 155 689 $1.10

Oxford U. (Gt. Brit.)
RECOMBINATION OF OXYGEN ATOMS IN THE GAS PHASE, by P. G. Dickens, R. D. Gould and others. Rept. on Contract AF 61(514)1117. Dec 60, 10p. 7 refs. AFOSR-TN-60-1016; AD-254 360.

DESCRIPTORS: *Oxygen, Atoms, *Recombination reactions, Reaction kinetics, Dissociation.

A study was made of the kinetics of the recombination of O atoms. A flow system was used and the rate of the gas phase recombination of O atoms was measured by the method of isothermal calorimetry. The O atoms were produced from electrolytic O gas, containing a small percentage of water vapour, by passage through a microwave discharge, 2450 Mcs/sec., and the decay of O atom concentration along the axis of a cylindrical pyrex tube, 4 cms. in diameter and 100 cms. long, was followed by a moveable isothermal probe. The decay process was found to be first order in O atoms, but second order in O molecules. The theoretical model employed in evaluating k_1 and k_3 assumes one dimensional flow and includes axial diffusion but neglects radial diffusion.

PB 154 170 $1.60

Pittsburgh Consolidation Coal Co., Library, Pa.
CONVERSION OF CARBONACEOUS FUELS TO ELECTRICAL ENERGY, by Everett Gorin and Howard L. Recht. Quarterly rept. no. 1, 1 May-31 July 54, on Contract DA 36-039-sc-63090. 20 Aug 54, 20p. AD-69 478.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Electric power production, *Fuel cells, Design, Tests, Electrolytes, Coal, Combustion, Electrochemistry.

A high temperature gaseous fuel cell using a solid electrolyte of the type described by O. K. Davtyan has been designed and partially fabricated. Studies have been conducted on fabrication of the solid electrolyte by melting and pouring as well as by pressing and sintering. The prior procedure has not been too successful in small scale batches. Partial separation of solid phases is observed due to rapid cooling in handling which results in an inhomogeneous casting. It is expected that the difficulty can be overcome by melting and handling larger batches of material. (Author)

PB 154 171 $5.60

Pittsburgh Consolidation Coal Co., Library, Pa.
CONVERSION OF CARBONACEOUS FUELS TO ELECTRICAL ENERGY, by Howard L. Recht and Everett Gorin. Quarterly rept. no. 4, 1 Feb-30 Apr 55, on Contract DA 36-039-sc-63090. 27 May 55, 59p. AD-69 501.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Electric power production, *Fuel cells, Design, Tests, Electrolytes, Silicates, Coal, Combustion, Electrochemistry.

A summary of the design and construction of the fuel cell assembly is given. The cell is designed for atmospheric pressure operation at temperatures up to 900°C. Performance characteristics of the fuel cell are given. Short term tests were carried out to determine what type of electrolytes and electrode activators give the best power output. Life test runs under conditions of continuous power drain were made with the use of those electrolytes which showed the most promising characteristics. In all cases a continuous loss in power with time was observed. Evidence was obtained to show that the power loss is probably due to concentration polarization, i.e., the current is carried largely by the sodium ions. A scheme has been evolved which shows promise of overcoming this difficulty.

PB 154 173 $4.60

Pittsburgh Consolidation Coal Co., Library, Pa.
CONVERSION OF CARBONACEOUS FUELS TO ELECTRICAL ENERGY, by Everett Gorin and Howard L. Recht. Quarterly rept. no. 10, 1 Aug-31 Oct 56, on Contract DA 36-039-sc-63090. [1956] 49p. 1 ref. AD-123 123.

This report released for sale to the public 26 June 61.

DESCRIPTORS: Coal, *Electric power production,

*Fuel cells, Electrochemistry, Design, Tests, Electrolytes

A saturator was installed in the fuel gas line to saturate the hydrogen with a known partial pressure of water. This gives better control of the variables determining cell performance. Electrolyte matrices of great stability can now be fabricated by use of reagent grade magnesia. The goal of longer cell life was brought closer, as one electrolyte maintained operation at elevated temperatures for one week. A fuel activator was found necessary for adequate performance when using stainless steel electrodes. No activator was required when nickel was used as the fuel electrode. The stainless steel air electrode requires no activator even at temperatures down to 600°C. Performance levels as high as ever achieved previously have been obtained using an electrolyte prepared by impregnation of a magnesia matrix with $NaLiCO_3$. Efforts to improve this performance through modifications in electrodes and activators were carried out, but further work along this line is required. A mathematical analysis of the recovery of the open circuit voltage after current drain due to diffusion was made which yielded some fruitful results and pointed the way for improved methods to gather data so that these analyses may be fruitful. (Author)

PB 154 174 $2.60

Pittsburgh Consolidation Coal Co., Library, Pa.
CONVERSION OF CARBONACEOUS FUELS TO ELECTRICAL ENERGY, by Everett Gorin and Howard L. Recht. Quarterly rept. no. 11, 1 Nov 56-31 Jan 57, on Contract DA 36-039-sc-63090. [1957] 30p. AD-128 131.

This report released for sale to the public 26 June 61.

DESCRIPTORS: Coal, Fuels, *Electric power production, *Fuel cells, Electrochemistry, Electrolytes, Tests, Design.

Various modifications were made in the installation including relocation to provide more working space, modification of the gas flow measuring systems to improve their accuracy, and acquisition of recorders to give the continuous measurement of cell output needed for more complete evaluation of the results. Fabrication of magnesia electrolyte matrices was carried to the point where their properties can be modified in the future to provide improved strength and consequent longer life. A technique for porosity measurements on these matrices was planned and carried out successfully. Initial results in the study of the factors affecting cell performance were obtained. These indicated (a) that when flat to insure good contact with the electrolyte, unactivated porous metal electrodes showed good performance, and (b) that carbon dioxide air depolarization gives strikingly faster voltage recovery after current drain in addition to higher output during the drain. A curious effect when initially the current exceeds its final constant value in drains was obtained. (Author) (See also PB 154 173)

PB 154 734 $3.60

Research Labs. for the Engineering Sciences, U. of Virginia, Charlottesville.
IONIZATION YIELD OF LOW-ENERGY HEAVY IONS IN ARGON, by J. A. Phipps, R. A. Lowry and J. W. Boring. Final rept. on Contract AF 49(638)22. Feb 61, 33p. 5 refs. Rept. no. EP-4419-106-61U; AFOSR-202; AD-251 199.

DESCRIPTORS: *Ionization chambers, Ions, *Ionization *Argon, Measurement, *Nitrogen, Gases, Hydrogen, Protons, Velocity, *Gas ionization.

A cylindrical ionization chamber with a differentially pumped open window has been used to measure the total ionization yield of low energy heavy ions stopped in argon gas. Measurements have been made in the energy range 8-100 kev for hydrogen, helium, carbon, nitrogen, oxygen, and argon ions. The average energy loss per ion pair ranges from 26.8 ev/i.p. for 50 kev hydrogen ions to 91.8 ev/i.p. for 25 kev argon ions. A comparison of the ionization yields in argon of various ions having velocities in the same region is presented. (Author) (See also PB 153 356)

PB 155 304 $1.60

Texas Technological Coll., Lubbock.
A CONTROLLED ATMOSPHERE THERMOBALANCE, by Wesley W. Wendlandt. Rept. on Contract AF 49(638)787. [1960] 15p. 20 refs. AFOSR-334; AD-253 138.

DESCRIPTORS: Atmosphere, *Pyrolysis, Strain gages, *Gravimetric analysis, Instrumentation, Electric bridges.

PB 155 136 $2.60

Texas Technological Coll., Lubbock.
THE THERMAL DEAQUATION OF SOME AQUOPENTAMMINECOBALT (III) COMPLEXES, by Wesley W. Wendlandt and John L. Bear. Rept. on Contract AF 49(638)787. 5 Mar 61, 24p. 27 refs. AFOSR-293; AD-252 982.

DESCRIPTORS: *Complex compounds, Complex ions, *Metalorganic compounds, *Reaction kinetics, Heat treatment, Hydrates, Halides, Stability, Heat of reaction, Chemical reactions, Dehydration, Temperature, *Cobalt compounds, Ammino compounds.

The thermal deaquation of $(Co(NH_3)_5H_2O)X_3$ type complexes, where X is Cl^-, I^-, and NO_3^-, was studied by the techniques of differential thermal analysis, thermogravimetric analysis, and other methods. The kinetics of the deaquation reaction was found to obey a first order rate law, with activation energy values ranging from 19 ± 2 to 31 ± 3 kcal. The heats of deaquation, as determined by quantitative differential thermal analysis, were 6.1 and 7.8 kcal. mole for the chloride and bromide complexes, respectively. Dissociation pressure measurements of the deaquation reaction showed it to be irreversible in the solid state. (Author)

EARTH SCIENCES

PB 150 225 $5.60

Iowa State U., Iowa City.
BALLOON OBSERVATIONS OF X-RAYS IN THE AURORAL ZONE II, by K. A. Anderson and D. C. Enemark. [1960] 51p. 8 refs. SUI 60-11; AD-242 404.

DESCRIPTORS: *Aurorae, *X-Rays, Scintillation counters, *Terrestrial magnetism, Spectrographic analysis, Electrons, Photons, *Meteorological ballons, High altitude.

Data from a long duration balloon flight at 35 km height over the auroral zone during Aug 1959 showed that only very small fluxes of energetic x-rays accompany visible aurorae at this latitude. The maximum observed photon flux above 25 kev during a bright aurora was 2.5 cm^{-2} sec^{-1}. However, much larger fluxes, up to 40 cm^{-2} sec^{-1}, preceded two active visible displays by about 1/2 hr. On 17 and 18 Aug x-ray influxes were observed for several hrs during the daytime. From Explorer VI data these are believed to be associated with the filling up of the outer radiation belt following a geomagnetic storm. The scintillation counter employed permitted a determination of the x-ray energy spectrum at 6 gm cm^{-2} depth from 25 to 300 kev on this and several other flights. The parent electron spectrum is derived and found to be extremely steep. Typically, the ratio of the differential photon intensity at 30 kev to that at 160 kev is 350 to one. Other balloon flights during Aug 1959 show that a large loss of electrons having energy >25 kev is occurring even on magnetically rather quiet days. (Author)

NYO-7949 $1.25

Pennsylvania State U. Coll. of Mineral Industries, University Park.
AN INVESTIGATION OF THE MINERALOGY, PETROGRAPHY, AND PALEOBOTANY OF URANIUM-BEARING LIGNITES. Analyses of lignite samples, by T. F. Bates and R. L. O'Neil. 1 Mar 60, 52p.

SCTM-74-61(72) $0.50

Sandia Corp., Albuquerque, N. Mex.
A METHOD OF CALIBRATING PRESS-EWING LONG-PERIOD SEISMOMETERS, by H. J. Plagge and H. G. Laursen. May 61, 13p.

Climatology and Meteorology

PB 154 142 $6.60

Marine Lab., U. of Miami, Coral Gables, Fla.
WEATHER RADAR RECEIVING SYSTEM, by H. W. Hiser and P. R. Ray. Final rept. 17 June 59-17 June 60, on Contract NOas 59-6217-C. July 60, 69p. 21 refs. 8942-4; ML 60241; AD-251 052L.

DESCRIPTORS: *Meteorological radar, *Radar receivers, Calibration, Tests

Calibration procedures and tests of a Range Attenuation Corrector and a video inversion type Isoecho Contour device developed under previous contracts are described and sources of error are discussed. Some theoretical aspects of range attenuation correction are presented which include a discussion of the use of logarithmic receivers and the problems of beam filling, earth shadow, and reflections. A brief description of a new developmental weather radar receiver system, which is being procured under the FY-1960 contract, is given. Statistical results of a precipitation echo height study based upon data from an MPS-4 height-finder radar are presented and the application of this echo height information to the range attenuation correction problem is discussed. A general discussion of laboratory activities and performance is also included. (Author)

PB 156 477 $4.60

Ronne Antarctic Research Expedition, Washington, D. C.
ANTARCTIC WEATHER STATISTICS, by H. C. Peterson. Technical rept. no. 1, 1947-1948, on Contract N6onr-280(00). 1 Sep 48, 49p. NAVEXOS P-560; ATI-209 405.

This report released for sale to the public 28 June 61.

DESCRIPTORS: *Meteorological data, Weather stations, Antarctic regions.

PB 150 885 $8.10

Science Communication, Inc., Washington, D. C.
PROPERTIES OF THE UPPER ATMOSPHERE. ROCKETSONDE AND SATELLITE MEASUREMENTS OF PRESSURE, TEMPERATURE, DENSITY AND COMPOSITION THROUGH EARLY 1960. Final rept. on Proj. Aries, Contract Nonr 3071(00). 1 Aug 60, 87p. 48 refs. AD-243 886.

DESCRIPTORS: *Upper atmosphere, Sounding rockets, *Meteorological data, Measurement, Satellite vehicles, Tables, Bibliography, North America, Physical properties.

The data given in this compilation were obtained from reports, publications, and direct communication with scientists who have made upper atmosphere structure measurements with sounding rockets and satellites. Data are reported for the 30 to 300 kilometer altitude range.

PB 155 797 $3.60

Stanford Research Inst., Menlo Park, Calif.
DETERMINATION OF THE PERCENT OF TIME THE GROUND IS VISIBLE FROM AN AIRCRAFT FLYING ABOVE CLOUDS, by Roy H. Blackmer, Jr. and John Harllee. Scientific rept. 1 on Contract AF 19(604)7312. Dec 60, 40p. SRI Proj. 3245; AFCRL-266; AD-254 278.

DESCRIPTORS: *Clouds, Distribution, *Nomographs, *Visibility, *Aerial photography, Mathematical analysis, Mathematical prediction, Height finding, Geometry.

Equations were derived to express the percent of time the ground is visible from an aircraft flying above various conditions of cloudiness. To permit rapid solution of the equations over a wide range of cloud dimensions and aircraft height, nomographic charts were constructed. The assumptions made to simplify the equations, and the intended applications of the equations, are discussed. (Author)

PB 155 694 $3.60

University Coll., Cork (Erie).
PRESSURE-TIME CURVE EXTRAPOLATION IN METEOROLOGICAL FORECASTING, by Geroge V. Kelly. Technical note no. 12 on Contract AF 61(514)1163. Dec 60, 40p. 4 refs. AFOSR-451.

DESCRIPTORS: *Weather forecasting, Time, Pressure, Mathematical analysis.

Frost Science

PB 156 587 $1.60

Army [Cold Regions Research and Engineering Lab.] Wilmette, Ill.
CREEP OF ICE AT LOW STRESSES, by T. R. Butkovich and J. K. Landauer. Rept. on Mechanics of Deformation of Snow and Ice. Aug 60, 11p. 16 refs. Research rept. 72.

This report released for sale to the public 3 July 61.

DESCRIPTORS: *Ice, Creep, Measurement, Stresses, Tests

Uniaxial compression tests were made on 2 x 2 x 6 cm samples of large-grained commercial ice and small-grained glacier ice at temperatures from -1.3 to -18.9C and stresses down to about 1 x 10^4 dynes/cm^2, using a special apparatus to permit simultaneous measurement of 3 samples at different stresses. The uniaxial stresses and strain rates were reduced to shear stresses and strain rates by dividing and multiplying, respectively, the former by $\sqrt{3}$. The log shear strain rate vs log shear stress curves was essentially linear for the low-stress creep measurements. Assuming a linear flow law for low-stress creep, activation energies for creep of about 14,300 cal/mole were determined. The smaller-grained ice had a higher viscosity coefficient than the larger-grained ice. The observed activation energy for creep of ice is probably that for self-diffusion. Although lacking a concrete deformation mechanism, the rate process theory, which leads to a hyperbolic sine stress dependence, seems to best describe the experimental results. (Author)

PB 156 584 $1.60

Army [Cold Regions Research and Engineering Lab.] Wilmette, Ill.
PLASTIC DEFORMATION OF HOLLOW ICE CYLINDERS UNDER HYDROSTATIC PRESSURE, by Akira Higashi. Rept. on Mechanics of Plastic Deformation of Ice. July 59, 15p. 10 refs. Research rept. 51; AD-233 534.

This report released for sale to the public 3 July 61.

DESCRIPTORS: *Ice, Deformation, Plasticity, Pressure, Hydrostatic pressure, Cylindrical bodies, Shear stresses, Stresses, *Crystals, Structures

The study was made in order to simulate the deformation of a tunnel in glacier ice and compare the results with the theoretical value derived from compression or tension tests. The plastic deformation of commerical polycrystalline ice and manufactured snow-ice was determined by measuring the discharge of oil from the cavity of closed hollow ice cylinders subjected to high external pressure in an oil-filled pressure chamber. The deformation vs time curves were similar to those obtained in compression or tension tests. The relationships between minimum strain rate and applied pressure, or between minimum strain rate and the circumferential stress at the surface of the inner cavity, were found to differ from the power law: $\dot{\epsilon} = \alpha\sigma^n$, the value of n being an increasing function of stress. Analysis of time-deformation curves indicates that viscoelastic models proposed by former investigators do not apply to the mechanism of the plastic deformation of ice. (Author)

PB 156 586 $1.60

Army [Cold Regions Research and Engineering Lab.] Wilmette, Ill.
SNOW DENSIFICATION THEORY AND ITS ENGINEERING APPLICATION, by R. W. Waterhouse and H. F. Steeves. Rept. on Snow Structures. Nov 60, 15p. 9 refs. Research rept. 71.

This report released for sale to the public 3 July 61.

DESCRIPTORS: *Snow, Density, Theory, Greenland

Simplified mathematical expressions are developed for approximating the densification process at depths between 10 and 40 ft in continuously accumulating polar snow. The expressions are based on accumulation and densification rates deduced from pit studies in 1959 at three locations on the Greenland Ice Cap. The depth-density relationship of surface snow to a depth of 30 ft is graphed for the three sites studied, as well as loads, densities, and rates of densification in relation to depth and time. Examples are given of the application of the derived relationships to specific problems of under-snow military construction. (Author)

PB 156 585 $1.60

Army [Cold Regions Research and Engineering Lab.] Wilmette, Ill.
THEORY OF DENSIFICATION OF DRY SNOW ON HIGH POLAR GLACIERS, by Henri Bader. Jan 60, 13p. 3 refs. Research rept. 69; AD-239 888.

This report released for sale to the public 3 July 61.

DESCRIPTORS: *Snow, Density, Glaciers, Mathematical analysis, Antarctic regions, Greenland

Relations between rate of snow accumulation, snow density, time, and depth below the surface are formulated in terms of a compactive viscosity factor, assumed to be a function of density and temperature alone. The parameters vary with the snow-type sequences of different climatic areas of high polar glaciers. The theory could be useful in an analysis of the data obtained from the large number of snow pits in Greenland, Ellesmere Island, and Antarctica. It is applicable to all observed depth-density profiles except those from very deep pits and corings. The rate of densification is no longer proportional to stress under higher stresses, but is some stronger function, and the theory then becomes more complicated. (Author)

PB 156 583 $3.60

Army [Cold Regions Research and Engineering Lab.] Wilmette, Ill.
VISCO-ELASTIC PROPERTIES OF SNOW AND ICE IN THE GREENLAND ICE CAP, by Ukichiro Nakaya. May 59, 39p. 16 refs. Research rept. 46; AD-226 274.

This report released for sale to the public 3 July 61.

DESCRIPTORS: *Ice, *Snow, Elasticity, Physical properties, Density, Temperature, Mathematical analysis, Greenland

A newly designed portabel visco-elastic meter was used to study snow and ice in Greenland. Ice samples from the ice tunnel at TUTO, core samples obtained by drilling in the ice cap at Site 2, and snow samples from near the surface of the ice cap were examined. The temperature and frequency dependence of Young's modulus and viscosity of tunnel ice were studied. The sample was cut in the shape of a rectangular bar and the resonance frequency of its bending vibration was measured for the calculation of Young's modulus. On the basis of the Young's modulus - density relationship, the whole range of snow and ice observable in the Greenland Ice Cap can be divided into three regions, each of which shows a different elastic nature. In region I, density 0.917-0.90 g/cm^3, Young's modulus decreases very rapidly when the density deviates slightly from that of pure ice. In region II, density 0.90-0.50 g/cm^3, the relation is linear; $E = (16.4\rho - 7.20)10^{10}$. In region III, density 0.50-0.25 g/cm^3, Young's modulus decreases in an exponential form: $E = C \exp[-k(0.50-\rho)]$. The structure factor k is 6.35 for ordinary settled snow, smaller for wind-packed snow, and larger for granular snow. (Author)

Geography

PB 150 010 $13.50

California U., Berkeley.
THE PHYSICAL GEOGRAPHY OF THE EAST COAST OF NICARAGUA, by Jeffrey Radley. Master's thesis. Rept. on Contract Nonr-222(11). 1960, 195p. 80 refs. AD-241 080.

DESCRIPTORS: *Nicaragua, *Geography, Ocean currents, Climate, Soils, Wind, Temperature, Topology, Geology.

Contents:
The physical base: The sea, The climate, The geological background
The coastal morphogenic regions: The lower Rio San Juan, Bluefields Lagoon, Pearl Lagoon, Coastal morphology--Rio Grande to Cabo Gracias á Dios, The Savanna landforms
The surface cover: The soils of Mosquitia, The southern rainforest, The tropical pine Savanna, The origin of the Savanna of Mosquitia

PB 156 642 $8.60

Syracuse U. Research Inst., N. Y.
A METHODOLOGY FOR RECORDING VEGETATION DESCRIPTIONS, WITH COMPARISONS OF VEGETATION TYPES OF THE PANAMA CANAL ZONE AND OTHER TROPICAL AREAS, by Charles C. Larson. Rept. on Military Evaluation of Geographic Areas, Contract DA 22-079-eng-207. May 59, 92p. 84 refs. AD-226 311.

This report released for sale to the public 3 July 61.

DESCRIPTORS: *Plants, *Military operations, Geography, Tropical regions, Panama, Terrain.

Using the Panama Canal Zone as a reference point, two steps were undertaken to provide a basis for evaluating vegetation as a terrain factor in military operations: (1) development of a methodology for recording descriptions of vegetation structures as quantitatively as possible; and (2) application of this methodology to descriptions of various tropical types for comparing them with each other and with types found in the Canal Zone. The factors considered physiognomically important were: (1) kinds of life-forms present and their respective prevalence and mode of distribution; (2) the vertical structure of life-forms; (3) the heights, diameters and spacings of individual life-form specimens; and (4) seasonal and leaf features. From these factors a concise formula was constructed and tabulated for 360 tropical vegetation types found in world tropical regions. Comparison of these formulas with those for Canal Zone vegetation reveals that only six types are highly similar to Canal Zone types and only about half bear substantial similarity. The Canal Zone lacks sufficient variety of vegetation types for comprehensive appraisal of the impacts of tropical vegetation on military activities.

Physics of the Atmosphere

PB 155 808 $4.60

Air Weather Service, Washington, D. C.
AIR DENSITY PROFILES FOR THE ATMOSPHERE BETWEEN 30 AND 80 KILOMETERS, by Roderick S. Quiroz. Jan 61, 48p. 46 refs. Technical rept. 150; AD-254 659.

DESCRIPTORS: *Air mass analysis, *Atmosphere, Upper atmosphere, Density, Measurement, Temperature, Air.

Data for 65 individual air density soundings in the mesosphere (30 to 80 km), taken during 1947-58 and at latitudes from the equator to 75°N, are presented. All values have been reduced to grams per cubic meter. Data from several rocket firings for levels above the mesopause are also included. An understanding of the pertinent observational methods is necessary for a correct interpretation of the density data. A brief description of the four principal methods is given, along with information on the inherent observational errors. The data for 30 to 80 km have been plotted on semi-log graph paper and density values at even-kilometer levels (2-km intervals) have been obtained.

PB 155 809 $1.60

Air Weather Service, Washington, D. C.
SEASONAL AND LATITUDINAL VARIATIONS OF AIR DENSITY IN THE MESOSPHERE (30 TO 80 KILOMETERS), by Roderick S. Quiroz. Mar 61, 18p. 14 refs. Technical rept. 151; AD-254 761.

DESCRIPTORS: *Upper atmosphere, Atmosphere, *Air mass analysis, Density, Air.

The results of a statistical analysis of mesosphere data, together with four other soundings, are given. The lowest densities are found in winter in arctic latitudes. At 65 km, the mean winter density is 60% of the mean summer density. The seasonal variation in

mid-latitudes is relatively small, amounting to less than 5% below 50 km, with a maximum of 13% at 66 km. The latitudinal gradient is greatest in winter and greatest at around 65 km. The gradient is directed northward from mid-latitudes, in the amount of 2% per degree of latitude (at 65 km), and there is a smaller gradient directed equatorward from mid-latitudes. At mid-latitudes, the standard deviation of density varies from 4% (of the mean density) at 30 km to about 20% near 60 km, remaining nearly constant up to the top of the mesosphere. In arctic latitudes, the standard deviation varies from 11% at 30 km to a maximum of about 40% near 60 km, decreasing to about 30% at 80 km.

ENGINEERING

PB 156 640 $7.60

Dynamic Analysis and Control Lab., Mass. Inst. of Tech., Cambridge.
BASIC RESEARCH AND DEVELOPMENT IN FLUID POWER CONTROL FOR THE UNITED STATES AIR FORCE, by J. Lowen Shearer. Progress rept. no. 4 on Contract AF 33(616)6120, continuation of Contract AF 33(616)3173. Sep 60, 76p. 11 refs. WADD Technical rept. 60-675; AD-248 889.

This report released for sale to the public 30 June 61.

DESCRIPTORS: *Hydraulic systems, Design, *Pneumatic systems, *Control systems, Tests, Gas generating systems, Servo motors, Gas bearings, *Pneumatic servomechanisms, Pneumatic valves, Hydraulic servomechanisms, *Hydraulic power systems, Servo systems, Control valves.

This report describes continuing applied research and development work on vital problems encountered in providing high performance hydraulic and pneumatic control systems for advanced system design and development. Increased emphasis on high pressure pneumatic components and systems reflects approach to an ultimate objective of employing hot gas power to operate such systems. Control valves, servomotors, gas bearings, and techniques of control are the major items discussed in this report. (Author) (See also PB 149 285)

Aeronautical Engineering

PB 156 469 $8.10

Dynamic Developments, Inc., Babylon, N. Y.
APPLICATION OF SUPERCAVITATING HYDROFOILS TO HIGH PERFORMANCE SEAPLANES. PART II: STEADY STATE HYDRODYNAMIC LOADS CALCULATIONS, by John H. Lueck. Rept. on Contract Nonr-2387(00). Mar 59, declassified 9 July 58. 87p. 12 refs. Rept. no. 108; AD-200 362.

This report released for sale to the public 27 June 61.

DESCRIPTORS: *Hydrofoils, *Jet seaplanes, Lift, Drag, Aspect ratios, Hydrodynamics, *Load distribution, Cavitation.

This report presents a method and data for rapid prediction of optimum life/drag ratios and associated design lift coefficient values for supercavitating hydrofoils applicable to high speed seaplane design. Hydrodynamic loads pertain to both surface piercing and fully submerged hydrofoils of arbitrary planform. Calculation of hydrodynamic loads is based upon methods recently developed at the NACA by Virgil E. Johnson. Supercavitating hydrofoils, of suitable configuration, exhibit lift/drag ratios which are considered high enough to warrant the use of such foils on high performance seaplanes. This is true even after allowance is made for an adequate design airplane trim variation which would result in foil angle of attack changes above and below normal design operating angles of attack. A hydrodynamic loads comparison between various supercavitating foil bottom shapes is given for an example main hydrofoil chosen as suitable for a general seaplane with a 150,000 lb. take off gross weight, a hull clearance speed of 65 knots and a take off speed of 200 knots. For particular surface piercing hydrofoils, a comparison is given between experimental and theoretical predictions of loads and minimum angles of attack for full foil ventilation.

PB 156 470 $5.60

Dynamic Developments, Inc., Babylon, N. Y.
APPLICATION OF SUPERCAVITATING HYDROFOILS TO HIGH PERFORMANCE SEAPLANES. PART III. STRUCTURAL CONSIDERATIONS, by Thomas Shervington. Rept. on Contract Nonr-2387(00). Apr 58, declassified 9 July 58. Rept. no. 109; AD-200 363.

This report released for sale to the public 27 June 61.

DESCRIPTORS: *Hydrofoils, *Jet seaplanes, Cavitation, Hydrodynamics

Portions of this report will not reproduce well.

APEX-587 $0.50

General Electric Co., Cincinnati, Ohio.
MAGNETIC AUTOMATIC POWER-RANGE CONTROL FOR AN AIRCRAFT NUCLEAR REACTOR, by J. A. Russell, S. F. Hemmenway and others. May 61, 19p.

PB 156 338-1 $16.50

Gibbs and Cox, Inc., New York.
HYDROFOIL HANDBOOK. VOLUME I: DESIGN OF HYDROFOIL CRAFT, by S. F. Hoerner, W. H. Michel and others. Rept. on Contract Nonr-507(00). 1954, declassified 1 July 58, 252p. 46 refs. AD-89 648.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Hydrofoil boats, Control, Design, Handbooks, Configuration, Tests, *Marine engineering, Materials, Hydrodynamics, Flying boat hulls.

PB 156 338-2 $19.75

Gibbs and Cox, Inc., New York.
HYDROFOIL HANDBOOK. VOLUME II: HYDRODYNAMIC CHARACTERISTICS OF COMPONENTS, by W. H. Michel, S. F. Hoerner and others. Rept. on Contract Nonr-507(00). 1954, declassified, 322p. 74 refs. AD-89 681.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Hydrofoil boats, Design, *Marine engineering, Hydrodynamics, Theory, Experimental data, Configuration, *Airfoils, Cavitation.

PB 155 810 $7.60

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
AN EXPERIMENT WITH A TRANSPIRATION-COOLED NOZZLE, by Richard P. Bernicker. Rept. on Contract AF 49(638)245. July 60, 78p. 25 refs. Technical rept. 447; AFOSR TN-60-1484; AD-254 260.

DESCRIPTORS: *Rocket motor nozzles, Gases, *Sweat cooling, Cooling, Helium, Coolants, Air, *Supersonic nozzles.

An experimental investigation of the cooling of a nozzle exposed to a high energy gas stream was designed and carried out in the Naval Supersonic Laboratory Hypersonic Wind Tunnel circuit. Cooling was effected by means of a porous strip located in the subsonic region of the two-dimensional nozzle, through which both "cold" helium and air were injected into the boundary layer. Thermocouple measurements were made on the impermeable surface downstream from the injection section to determine the residual effect of cooling under various conditions of coolant mass flow rate, stagnation temperature, and coolant gas used. Two test nozzles were fabricated; each having the porous injection section located at a different position with respect to the nozzle throat. Data was correlated and results indicated that a wall cooling parameter could be expressed as a function of the injection rate for both models tested. The decay of the cooling achieved with distance was determined to be a power function of the downstream distance after injection, the exponential term being a function of the injection rate. Limited analytical results for zero pressure gradient flows yielded a basis for the resulting form of the decay function. (Author)

PB 156 309 $7.60

Princeton U., N. J.
STABILITY AND CONTROL OF UNDUCTED STAND-ON HELICOPTERS: PRELIMINARY THEORETICAL AND FLIGHT TEST RESULTS, by M. W. Townsend, Jr. Rept. on Contract DA 44-177-TC-392. Nov 57, 74p. 5 refs. Dept. of Aeronautical Engineering rept. no. 404; AD-120 524.

This report released for sale to the public 26 June 61.

DESCRIPTORS: Flight testing, Stability, *Helicopters, Test vehicles, Flying platforms, Tail helicopter rotors.

This report deals with the longitudinal static and dynamic stability of unducted stand-on helicopters. A method of calculating trim equilibrium is developed. Linearized equations of motion are written. The stability derivatives are evaluated theoretically. Analog computer results are obtained using the theoretical stability derivatives and equations of motion. A flight test program utilizing a de Lackner DH-4 Aerocycle is described and results of that test program are compared to the theoretical predictions. Factors are discussed for matching of flight test and theoretical results. The flight test results and experience indicate possible stability requirements for machines utilizing kinaesthetic control. Requirements for an improved machine would include dynamic stability with a nearly neutrally stable trim moment curve. Methods of satisfying these requirements are considered. The two most promising appear to be (1) a horizontal tail and (2) lowering the position of center of gravity and drag. (Author)

Chemical Engineering

NYO-9155 $1.00

Alloyd Corp., Cambridge, Mass.
DEVELOPMENT OF AN INSTRUMENT AND TECHNIQUE UTILIZING CARBON-14 FOR MEASURING VERY LOW CONCENTRATIONS OF OXYGEN IN HIGH PURITY METALS, by R. A. Covert. Rept. on Contract AT(30-1)-2335. 1 May 61, 43p.

IS-190 $1.00

Ames Lab., Iowa State U. of Science and Tech.
RESEARCH REPORT IN ENGINEERING. Annual summary, 1 July 59-30 June 60, on Contract W-7405-eng-82. Aug 60, 43p.

HW-66715 $1.00

Hanford Atomic Products Operation, Richland, Wash.
AIR LIFT RECIRCULATION THROUGH UO_2 BEDS, by F. D. Fisher. Rept. on Contract AT(45-1)-1350. Dec 60, 36p.

HW-62902 $0.75

Hanford Atomic Products Operation, Richland, Wash.
SIMULATION OF A RECIRCULATING, STIRRED CHEMICAL DISSOLVER ON AN ANALOG COMPUTER, by G. R. Taylor. Rept. on Contract AT(45-1)-1350. Mar 61, 32p.

PB 156 325 $1.60

Naval Engineering Experiment Station, Annapolis, Md.
DEARBORN FORMULA 662 AS SCALE PREVENTIVE FOR SEA-WATER EVAPORATORS, by G. R. Garber. 11 Dec 53, 16p. E.E.S. rept. 010058E.

This report released for sale to the public 28 June 61.

DESCRIPTORS: *Sea water, *Evaporators, Tests, Desalination, *Corrosion inhibition, Heat transfer.

Dearborn Formula 662 was tested for prevention of scale in a Navy low-pressure, sea-water evaporator. The treatment was discontinued before the scheduled completion date because it seriously reduced heat transfer. (Author)

PB 156 324 $1.60

Naval Engineering Experiment Station, Annapolis, Md.
HAGEVAP AS A SEA-WATER-SCALE PREVENTIVE IN LOW PRESSURE EVAPORATORS, by G. R. Garber. 14 Sep 53, 14p. E.E.S. rept. 010058C.

This report released for sale to the public 28 June 61.

DESCRIPTORS: *Sea water, *Evaporators, Tests, Desalination, *Corrosion inhibition, Heat transfer.

HAGEVAP, a proprietary scale preventive for sea-water evaporators, was compared with Navy boiler compound-cold shock treatment. The Navy treatment maintained better evaporator efficiency in these tests. (Author)

DP-582 $0.50

Savannah River Lab., Aiken, S. C.
LABORATORY EVALUATION OF AN AUTOMATIC GAS CHROMATOGRAPH, by D. L. West. Rept. on Contract AT(07-2)-1. May 61, 15p.

Civil Engineering

PB 156 581 $1.60

Army [Cold Regions Research and Engineering Lab.] Wilmette, Ill.
PRELIMINARY SNOW COMPACTION FIELD TESTS USING DRY PROCESSING METHODS, by A. F. Wuori. Interim rept. for 1956-57 on Snow Runway Compaction. Mar 59, 13p. 1 ref. Technical rept. 53.

This report released for sale to the public 3 July 61.

DESCRIPTORS: *Snow, Greenland, Stabilization, Tests, Snow roads, Runways, Construction

The studies were conducted in the winter of 1956-57 on test lanes constructed of snow disaggregated by various rotary snowplows and compacted with rollers or vibrators. The effectiveness of each process was evaluated in terms of density increase, grain-size distribution, final hardness, and bearing capacity. Disaggregation increased the initial densities of γ = 0.30-0.36 g/cm^3 to values ranging from 0.47-0.51 g/cm^3. Immediate compaction of freshly disaggregated snow with a single Jackson vibrator produced a surface density of 0.57 g/cm^3 while a lapse of 1 hr before compaction reduced the final density to 0.53 g/cm^3. The first pass of the vibrator gave the most compaction: additional effect after 2 passes was negligible. Rolling was most effective when rubber-tired and corrugated rollers were used in sequence, achieving a density increase of 8% in the top 10 in. of snow, and best results with rolling were obtained on snow near the melting point. The strength of snow is proportional to γ - 0.38 so that the small increase in density achieved causes a great increase in strength. (Author)

PB 156 582 $2.60

Army [Cold Regions Research and Engineering Lab.] Wilmette, Ill.
SNOW STABILIZATION USING DRY PROCESSING METHOD, by Albert F. Wuori. Interim rept. on Snow Road and Runway Construction. July 60, 22p. 3 refs. Technical rept. 68.

This report released for sale to the public 3 July 61.

DESCRIPTORS: *Snow, Greenland, Stabilization, Test, Snow roads, Runways, Construction

The results of experiments in the no-melt zone of the Greenland Ice Cap in the summer of 1958 to determine the effectiveness of dry processing for compacting cold granular snow are reported. The experiments were conducted with vibratory compactors, a sheepsfoot roller, a corrugated snow roller, and a combination of rollers and vibratory compators on test lanes prepared from a layer of Peter snow 3 ft thick, leveled with a tractor blade. A D-8 tractor was the tow vehicle. Each method was evaluated in terms of resulting density, final hardness, crushing strength, and bearing capacity of the processed snow. Best results were obtained with the low-ground-pressure tracks of the D-8 tractor, the resulting snow being sufficiently dense and hard to support some types of wheeled airplanes. Varying the vibration frequency of vibratory compactors effected no great change in compaction, although 3000 vpm appeared to be most effective. Precompaction with a sheepsfoot roller before vibration resulted in greater snow density and hardness. The speed of the snow miller was found to affect the resulting snow density and hardness, better results being obtained at the normal higher operating speed than at low speeds. A solution to the persistent problem of leveling Peter snow may be found by mounting a snow planer with adequte controls to the rear of the processing unit and by using a special rear discharge chute to distribute the snow more evenly behind the plow. (Author)

PB 171 844 $1.25

Naval Civil Engineering Lab., Port Hueneme, Calif.
SOIL STABILIZATION BY VIBRATION, by C. R. White. 13 Mar 61, 45p. 10 refs. Technical rept. R-126; AD-253 432.

DESCRIPTORS: *Soils, Stabilization, Roads, Vibration, Density, Airports, Construction, Pavements, Landing fields, Machines.

A theoretical and experimental determination was made of the factors that control vibratory compaction of sand. A 6-1/2-ton vibratory compactor was then designed and built to evaluate the theoretical and experimental findings. The machine effectively compacted sand to depths not previously achieved by con-

ventional compaction equipment. It compacted sand subgrade beneath a flexible pavement while operating on the pavement surface, and it compacted highway base material in fills 20 and 40 inches deep. It also had brief trials on Navy airfield construction. Further studies to reveal vibratory methods for compacting cohesive soils have included theoretical and experimental determination of parameters, and the design and construction of a research compactor for field studies. The new machine was necessary, because the characteristics of the sand compactor were not suitable for compacting cohesive soils. However, field testing and evaluation of the range and degree of effectiveness of the new machine for compacting cohesive soils remain to be authorized and accomplished. (Author)

Electrical and Electronic Engineering

PB 156 655 $12.50

Armour Research Foundation, Chicago, Ill.
PRINTED-WIRING SOLDERED ELECTRICAL CONNECTIONS, by E. H. Koeller and H. R. Nelson. Final rept. 15 July 58-15 July 59, on Contract DA 36-039-sc-78167. [1959] 178p. 2 refs. ARF Proj. K159; AD-230 931.

This report released for sale to the public 30 June 61.

DESCRIPTORS: *Printed circuits, *Electric connectors, Vibration, Shock resistance, Soldering, Non-destructive testing, Manufacturing methods, Industrial production, Materials.

The over-all objective was the improvement of soldered connections used in printed wiring circuits by assessing the importance of modes of solder-connection failure and by investigating basic causes of failure and appropriate curative measures. The investigation was directed toward establishing basic design criteria concerning behavior of materials, stress distribution, strength, and performance of component parts of the connections. These criteria were applied in the redesign or optimization of 8 basic soldered connections in use in printed-wiring circuits. The portion of the electronics industry using printed-wiring dip-soldering methods was studied by a review of literature describing board materials, methods of producing printed-wiring circuits, and various soldering processes. Representative leading manufacturers in the printed-wiring dip-soldering field were visited to determine the state of the art and to identify specific problem areas. The appendices comprise theoretical analyses of and/or solutions of problems encountered on the program. They include a mathematical analysis and development of equations relating forces and stresses to which connections are subjected under shock and vibration loading, and a theoretical derivation of equations for the maximum capillary rise of solder and the rate of that rise.

PB 156 328 $4.60

[Army Signal Research and Development Lab.]
Fort Monmouth, N. J.
ANNUAL BATTERY RESEARCH AND DEVELOPMENT CONFERENCE NO. 8, 25 - 26 MAY 1954. [1954] 46p. AD-69 654.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Primary batteries, *Storage batteries, Materials, Electrochemistry, Power supplies, Conferences.

Contents:
Improved lead-acid batteries, by J. F. Dittmann
Internal heaters for storage batteries, by Carrol A. Peterson
AC heating of storage batteries by Marcel J. Racine
Improved nickel-cadmium batteries, Paul Rappaport
Test methods for alkaline storage batteries, by Karl Kordesch
The battery industrial preparedness program, by Charles H. Clark
Zinc-silver oxide system, by J. S. Bone
Zinc-silver oside system, by John B. Conn
Activating devices, by H. C. Davis
Water-activated systems, by E. M. Morse
Nickel-cadmium system, by L. Grant Hector
Mercuric oxide system, by Karl S. Willson
Chlorine depolarized system, by J. D. Miller
Nuclear batteries, by Alexander Thomas
Nuclear batteries, by John H. Coleman
Solid electrolyte battery, by Stuart J. Shapiro
Conductive plastic cell, by Herbert A. Gottschall
New electrochemical systems, by Leslie D. McGraw
Battery separator materials, by Robert C. Shair

PB 154 974 $6.60

Battelle Memorial Inst., Columbus, Ohio.
AN INVESTIGATION AND EVALUATION OF VARIOUS CORE CONFIGURATIONS AND MATERIALS FOR OPTIMUM TRANSFORMER DESIGN, by C. F. Rains, R. C. McMaster and others. Quarterly rept. no. 4, 1 Jan-31 Mar 50, on Contract W36-039-sc-38255. 1 Apr 50, 61p. 4 refs. ATI-128 732.

This report released for sale to the public 28 June 61.

DESCRIPTORS: *Transformers, *Magnetic cores, Materials, Tests, Design.

A. C. core-loss and permeability equipment has been set up similar to A. S. T. M. designation A-34-48. The average-reading or flux voltmeter was calibrated and core loss tests were made on seven sets of Epstein samples. Core-loss tests at temperatures from about 80°F. to 1381°F. were made on four E I laminated cores. The core loss was found to decrease as much as 60 per cent from room temperature to 1000°F. Two-mil, four-mil, and fourteen-mil oriented silicon-iron Epstein samples were tested at frequencies of 60, 100, and 200 cycles per second. The percentage rise of core loss at 10,000 gausses from 60 to 200 cycles per second was approximately 1.7 times greater for the fourteen-mil sample than for the two-mil sample. A study

was made of the effect on the core loss of different stacking arrangements and clamping pressures of E I laminated cores. The laminations were assembled in groups of one, two, three, and four. While various clamping pressures indicated no trend, it was found that the larger the number of laminations in a group the greater was the core loss. (Author)

PB 171 757 $0.50

Bureau of Naval Weapons, Washington, D. C.
ANALYZER, HARMONIC WAVE GENERAL RADIO 736A. BuWeps-BuShips Calibration Program. 29 Jan 59, 39p. Secondary Standards Lab. Instrument Calibration Procedure AW-06.

DESCRIPTORS: *Voltmeters, *Harmonic analyzers, Calibration, Instrumentation.

The Test Instrument is a tunable voltmeter with a 4-cps bandwidth used to measure complex voltage waves from 30 μv to 300 volts in the frequency range of 20 cps to 16.5 kc.

PB 171 765 $0.50

Bureau of Naval Weapons, Washington, D. C.
BALANCE CASE. BuWeps-BuShips Calibration Program. 10 Dec 59, 7p. [Secondary Standards Lab.] Fabrication Instructions TDO D-11.

DESCRIPTORS: *Balances, Containers, Design

The TDO D-11 balance case was designed primarily for the Christian Becker Model BB-4 heavy capacity balance. However, it may be used for other balances of similar dimensions.

PB 171 763 $0.50

Bureau of Naval Weapons, Washington, D. C.
BATTERY PACK. BuWeps-BuShips Calibration Program. 23 Sep 59, 21p. [Secondary Standards Lab.] Fabrication Instructions TDO D-5.

DESCRIPTORS: *Dry cells, *Packs, Direct current, Sources.

PB 171 758 $0.50

Bureau of Naval Weapons, Washington, D. C.
CAPACITANCE, 0.001 TO 1 μF DIRECT SUBSTITUTION METHOD DECADE TYPE 1000 CPS. BuWeps-BuShips Calibration Program. 20 Aug 58, rev. 16 May 60. 10p. Secondary Standards Lab. Measurement System Operation Procedure BC-06.

DESCRIPTORS: Capacitance bridges, Capacitors, *Electrostatic capacitance, Measurement, Calibration, Instrumentation

This procedure utilizes the Capacitance Bridge, Standard Decade Capacitor, and Precision Adjustable Capacitor to measure the Test Instrument incremental capacitance per decade step. The capacitance measurements are accomplished by use of the substitution technique.

PB 171 766 $0.50

Bureau of Naval Weapons, Washington, D. C.
DC CURRENT SUPPLY UNIT. BuWeps-BuShips Calibration Program. 23 Sep 59, 52p. [Secondary Standards Lab.] Fabrication Instructions TDO D-12.

DESCRIPTORS: *Direct current, Sources.

PB 171 767 $0.50

Bureau of Naval Weapons, Washington, D. C.
DC CURRENT SUPPLY UNIT. BuWeps-BuShips Calibration Program. 28 Oct 59, 27p. [Secondary Standards Lab.] Technical Manual TDO D-12.

DESCRIPTORS: *Direct current, Sources.

The specifications of the unit are:output current: 0 to 200 amperes DC; output voltage: 5.4 volts DC; rated capacity: 450 ampere-hours; resolution: continuously variable; dimensions: height, 51", width, 24", depth, 27" including handles and terminals.

PB 171 755 $0.50

Bureau of Naval Weapons, Washington, D. C.
DECADE BOX, POWDER RESISTOR CLAROSTAT 240C. BuWeps-BuShips Calibration Program. 28 Jan 59, 14p. Secondary Standards Lab. Instrument Calibration Procedure AR-01.

DESCRIPTORS: *Resistors, Calibration, Instrumentation, Electric bridges, Resistance

This procedure utilizes a Wheatstone bridge to measure the resistance of the Test Instrument in the range of 1 ohm to 999,999 ohms. The resistance measurements are accomplished by connecting the Test Instrument directly to the Wheatstone bridge and setting the bridge ratio plugs and rheostat dials to balance the bridge. The resistance value of the Test Instrument is the product of the bridge plug ratio times the rheostat switch settings.

PB 171 738 $0.50

Bureau of Naval Weapons, Washington, D. C.
ELECTRONIC COUNTERS, HEWLETT PACKARD 524B, 524C, 524D, OR FR-38A/U (AN/USM-26). BuWeps-BuShips Calibration Program. 28 Nov 60, 31p. Secondary Standards Lab. Instrument Calibration Procedure AF-06 (Rev. 1).

DESCRIPTORS: *Power supplies, *Voltage, Crystals, Stability, Calibration, Instrumentation.

PB 171 734 $0.50

Bureau of Naval Weapons, Washington, D. C.
ELECTRONIC MULTIMETER ME-6D/U. BuWeps-BuShips Calibration Program. 3 Mar 60, 18p. Secondary Standards Lab. Instrument Calibration Procedure AE-11.

DESCRIPTORS: *Multimeters, Calibration, Instrumentation.

The Test Instrument is a sensitive electronic voltmeter having a logarithmic scale with suppressed zero. An output jack, selector, and potentiometer are provided to permit use of the instrument as a high-gain amplifier.

PB 171 741 $0.50

Bureau of Naval Weapons, Washington, D. C.
EPUT METER BERKELEY MODEL 554. BuWeps-BuShips Calibration Program. 6 Oct 59, 19p. Secondary Standards Lab. Instrument Calibration Procedure AF-16.

DESCRIPTORS: *Voltmeters, Calibration, Instrumentation, Voltage

The Test Instrument measures the number of electrical impulses per unit time by means of electronic counting and gating circuits.

PB 171 737 $0.50

Bureau of Naval Weapons, Washington, D. C.
EPUT METER BERKELEY MODEL 554. BuWeps-BuShips Calibration Program. 25 Nov 58, rev. 26 May 60, 20p. Secondary Standards Lab. Instrument Calibration Procedure AF-05.

DESCRIPTORS: *Voltmeters, Calibration, Instrumentation, Voltage

The Test Instrument measures the number of electrical impulses per unit time by means of electronic counting and gating circuits.

PB 171 739 $0.50

Bureau of Naval Weapons, Washington, D. C.
FREQUENCY CONVERTER HEWLETT PACKARD 525B OR CV-394/USA-5 (AN/USA-5). BuWeps-BuShips Calibration Program. 9 Oct 60, 10p. Secondary Standards Lab. Instrument Calibration Procedure AF-13 (Rev. 1).

DESCRIPTORS: *Frequency converters, Calibration, Instrumentation.

The Test Instrument consists of a harmonic generator, a mixer, an amplifier, and a tuning eye. The Test Instrument harmonic generator is driven with a precision 10 megacycle signal derived from the electronic counter. Tuned circuits, at 10 Mc intervals, from 100 to 210 Mc are individually selected by the front panel MIXING FREQUENCY MC switch, and the selected harmonic is heterodyned in the mixer with the frequency to be measured. The difference frequency is passed on and displayed by the electronic counter.

PB 171 752 $0.50

Bureau of Naval Weapons, Washington, D. C.
GENERAL RADIO 1210-C UNIT OSCILLATOR. BuWeps-BuShips Calibration Program. 8 Jan 60, rev. 31 May 60, 36p. Secondary Standards Lab. Instrument Calibration Procedure AG-15.

DESCRIPTORS: Radiofrequency, *Oscillators, Calibration, Instrumentation.

The Test Instrument is an oscillator which produces sine waves and square waves at frequencies from 20 cps to 500 kc.

PB 171 751 $0.50

Bureau of Naval Weapons, Washington, D. C.
GENERAL RADIO 1218-A UNIT OSCILLATOR. BuWeps-BuShips Calibration Program. 13 Mar 59, rev. 31 May 60, 18p. Secondary Standards Lab. Instrument Calibration Procedure AG-14, supersedes AG-33.

DESCRIPTORS: Radiofrequency, *Oscillators, Calibration, Instrumentation

The Test Instrument is a compact oscillator which produces frequencies from 900 to 2000 megacycles. It has provisions for external sine-wave and square-wave modulation.

PB 171 745 $0.50

Bureau of Naval Weapons, Washington, D. C.
GENERATOR, SQUARE WAVE HEWLETT PACKARD 211A. BuWeps-BuShips Calibration Program. 24 Nov 58, rev. 1 Aug 60, 23p. Secondary Standards Lab. Instrument Calibration Procedure AG-07.

DESCRIPTORS: *Generators, Calibration, Instrumentation

The Test Instrument is a square-wave generator having a frequency range from 1 cps to 1 Mc. The regulated output voltage of the power supply is measured with a VTVM at normal line voltage and if necessary, is adjusted to -200 volts. The frequency dial and range switch are calibrated by measuring the output with an electronic counter at selected frequencies. Sync sensitivity is tested by setting the Test Instrument frequency controls to 980 cps and verifying that the output will change to 1000 cps when an external signal of 2.2 volts rms at 1000 cps is injected into the sync input. The specified output waveform is verified on the oscilloscope display while the symmetry control is set within 30% of the center of its range. The rise time of the square wave is measured on the oscilloscope display by observing the horizontal displacement of the leading edge between 10% and 90% of its maximum value. The amplitude of the output at the 600-ohm terminals is measured with an oscilloscope using a low-capacity probe. The 75-ohm attenuator is compared directly with the db range switch of the VTVM.

PB 171 754 $0.50

Bureau of Naval Weapons, Washington, D. C.
GENERATOR, SQUARE WAVE HEWLETT PACKARD 211A. BuWeps-BuShips Calibration Program. 19 Sep 59, 22p. Secondary Standards Lab., Instrument Calibration Procedure AG-24.

DESCRIPTORS: *Generators, Calibration, Instrumentation

The Test Instrument is a square-wave generator having a frequency range from 1 cps to 1 Mc.

PB 171 743 $0.50

Bureau of Naval Weapons, Washington, D. C. GENERATOR, TIME-MARK TEKTRONIX 180-S1. BuWeps-BuShips Calibration Program. 1 Oct 58, 28p. Secondary Standards Lab. Instrument Calibration Procedure AG-01.

DESCRIPTORS: *Generators, Calibration, Instrumentation, Pulse generators

The Test Instrument consists of a precision 1 Mc crystal oscillator, frequency dividing and multiplying systems. The frequency dividing system produces marker pulses with various spacings, which may be selected separately or superimposed to form a timing comb, as well as accurate trigger pulses which are used to synchronize oscilloscope displays. The multiplying system provides fixed-frequency sine-wave output signals.

PB 171 753 $0.50

Bureau of Naval Weapons, Washington, D. C. HEWLETT PACKARD 205 AG AUDIO SIGNAL GENERATOR. BuWeps-BuShips Calibration Program. 6 July 59, 34p. Secondary Standards Lab. Instrument Calibration Procedure AG-20.

DESCRIPTORS: Audiofrequency, *Signal generators, Calibration, Instrumentation.

The Test Instrument is an audio-frequency signal generator designed for gain and frequency response measurements in amplifiers or networks.

PB 171 733 $0.50

Bureau of Naval Weapons, Washington, D. C. MICROVOLTER, AUDIO FREQUENCY GENERAL RADIO 546-C. BuWeps-BuShips Calibration Program. 19 May 59, 15p. Secondary Standards Lab. Instrument Calibration Procedure AE-06.

DESCRIPTORS: Audiofrequency, *Voltage dividers, Calibration, Instrumentation.

The Test Instrument is an audio-frequency voltage divider. A panel meter is provided for measuring the input voltage, and a decade switch and variable control permit adjustment at the output to calibrated values.

PB 171 735 $0.50

Bureau of Naval Weapons, Washington, D. C. MULTIPLIER, PERIOD HEWLETT PACKARD 526C. BuWeps-BuShips Calibration Program. 9 Oct 58, rev. 26 May 60, 10p. Secondary Standards Lab. Instrument Calibration Procedure AF-01.

DESCRIPTORS: *Frequency multipliers, Calibration, Instrumentation.

The Test Instrument is a plug-in period multiplier unit used with the HP 524 series of electronic counters to increase the accuracy of period measurements. Period multiplication is accomplished by dividing the input frequency in decade steps with three decade dividers of 10, 100, and 1000. Reliable operation of the decade dividers is obtained by an amplitude discriminator circuit which converts the input signal waveform into sharp, constant-amplitude pulses.

PB 171 740 $0.50

Bureau of Naval Weapons, Washington, D. C. MULTIPLIER, PERIOD HEWLETT PACKARD 526C. BuWeps-BuShips Calibration Program. 19 Sep 59, 10p. Secondary Standards Lab. Instrument Calibration Procedure AF-14.

DESCRIPTORS: *Frequency multipliers, Calibration, Instrumentation.

The Test Instrument is a plug-in period multiplier unit used with the HP 524 series of electronic counters to increase the accuracy of period measurements. Period multiplication is accomplished by dividing the input frequency in decade steps with three decade dividers of 10, 100, and 1000. Reliable operation of the decade dividers is obtained by an amplitude discriminator circuit which converts the input signal waveform into sharp, constant-amplitude pulses.

PB 171 749 $0.50

Bureau of Naval Weapons, Washington, D. C. OSCILLATOR, AUDIO HEWLETT PACKARD 201B. BuWeps-BuShips Calibration Program. 31 Dec 58, rev. 27 May 60. 26p. Secondary Standards Lab. Instrument Calibration Procedure AG-11.

DESCRIPTORS: Audiofrequency, *Oscillators, Calibration, Instrumentation

The Test Instrument is an audio oscillator which produces frequencies from 20 cps to 20 kc and has a rated output voltage of 42.5v across a 600-ohm load.

PB 171 746 $0.50

Bureau of Naval Weapons, Washington, D. C. OSCILLATOR, TEST HEWLETT PACKARD 650A. BuWeps-BuShip Calibration Program. 15 Dec 58, rev. 27 May 60, 34p. Secondary Standards Lab. Instrument Calibration Procedure AG-08.

DESCRIPTORS: *Oscillators, Calibration, Instrumentation

The Test Instrument is a wide range oscillator that produces frequencies from 10 cps to 10 Mc. It includes a VTVM to monitor output voltage and an attenuator that controls the range of output voltage.

PB 171 744 $0.50

Bureau of Naval Weapons, Washington, D. C. OSCILLATORS, WIDE RANGE HEWLETT PACKARD 200 CD AND HP SPECIFICATION 23680. BuWeps-BuShips Calibration Program. 8 Jan 60, 21p. Secondary Standards Lab. Instrument Calibration Procedure AG-05

DESCRIPTORS: *Oscillators, Calibration, Instrumentation.

The Test Instrument is a wide-range low distortion oscillator with a frequency range of 5 cps to 600 kc.

PB 171 759 $0.50

Bureau of Naval Weapons, Washington, D. C. PHASE, 0 TO 360 DEGREES. BuWeps-BuShips Calibration Program. 30 Sep 58, 15p. Secondary Standards Lab. Measurement System Operation Procedure BZ-01.

DESCRIPTORS: *Phase measurement, Instrumentation, Calibration.

This procedure utilizes a phase shifter and a precision phase meter to establish two signals whose phase angle is accurately known. These signals are then used to calibrate phase angle measuring instruments.

PB 171 771 $0.50

Bureau of Naval Weapons, Washington, D. C. PRECISION RESISTOR TEST FIXTURE. BuWeps-BuShips Calibration Program. 29 Oct 59, 23p. [Secondary Standards Lab.] Fabrication Instructions TDO D-27.

DESCRIPTORS: *Resistors, Calibration, Instrumentation

The Resistance Test Fixture was designed to provide a convenient and reliable method of making electrical connections to Precision Standard Resistors. The contact surfaces are amalgamated with mercury to insure good low resistance electrical connections. When requirements demand, it is possible to immerse the entire unit into an oil bath with a suitable degree of temperature control and, under these conditions, increase the load coefficient of the test resistor.

PB 171 742 $0.50

Bureau of Naval Weapons, Washington, D. C. REED-TYPE FREQUENCY METERS. BuWeps-BuShips Calibration Program. 26 Feb 60, 9p. Secondary Standards Lab. Instrument Calibration Procedure AF-19.

DESCRIPTORS: *Frequency meters, Calibration, Instrumentation.

This procedure applies to the calibration of reed-type frequency meters within the frequency range of 30 to 1200 cps and within a voltage range of 5 to 750 volts.

PB 171 764 $0.50

Bureau of Naval Weapons, Washington, D. C. REVERSING-TRANSFER SWITCH. BuWeps-BuShips Calibration Program. 24 July 59, 8p. [Secondary Standards Lab.] Fabrication Instructions TDO-D-9.

DESCRIPTORS: *Transfer switches, Design, Switches

PB 171 769 $0.50

Bureau of Naval Weapons, Washington, D. C. SIGNAL SOURCE MODULATOR. BuWeps-BuShips Calibration Program. 15 June 60, 12p. [Secondary Standards Lab.] Fabrication Instructions TDO D-21.

DESCRIPTORS: *Modulators, Design, Operation, Maintenance, Signals.

The Signal Source Modulator was designed to provide a simple means for 100% square-wave modulating the output of the General Radio Type 1215B, 1209B, and 1218-A unit oscillators. This type of output signal is required for use in audio substitution systems for measuring microwave attenuation, VSWR measurements, and for other applications where modulated RF having low incidental FM is required.

PB 171 768 $0.50

Bureau of Naval Weapons, Washington, D. C. SPACER BLOCKS. BuWeps-BuShips Calibration Program. 15 Dec 59, 2p. [Secondary Standards Lab.] Fabrication Instructions TDO D-15.

DESCRIPTORS: Calibration, Instrumentation, *Terminal blocks.

PB 171 756 $0.50

Bureau of Naval Weapons, Washington, D. C. TEST SET, RADIO AN/URM-6, AN/URM-6B, OR STODDART AIRCRAFT RADIO CO. NM-10A. BuWeps-BuShips Calibration Program. 9 Mar 61, 18p. Secondary Standards Lab. Instrument Calibration Procedure AS-03.

DESCRIPTORS: *Radio receivers, *Test sets, Calibration, Instrumentation, Voltage, Measurement.

The Test Instrument is a sensitive low frequency radio receiver which is capable of measuring voltages as low as one microvolt.

PB 171 747 $0.50

Bureau of Naval Weapons, Washington, D. C. UHF SIGNAL GENERATOR HEWLETT PACKARD 612A. BuWeps-BuShips Calibartion Program. 18 Dec 58, 46p. Secondary Standards Lab. Instrument Calibration Procedure AG-09.

DESCRIPTORS: Ultra high frequency, *Signal generators, Calibration, Instrumentation.

The Test Instrument is a UHF signal generator with a frequency range of 450 to 1230 megacycles. It has an output meter, output level controls, and a calibrated variable attenuator which are used to monitor and control the output voltage from 0.1 microvolts to 0.5 volts. It can be modulated by internal 400 cps and 1000 cps sine waves, by external sine waves from 20 cps to 5 megacycles, and by pulses. Sine wave modulation may be up, down, or symmetrical about the carrier level. The percentage of modulation is indicated on a panel meter.

PB 171 750 $0.50

Bureau of Naval Weapons, Washington, D. C.
UNIT OSCILLATOR GENERAL RADIO 1209-B. BuWeps-BuShips Calibration Program. 26 Feb 59, rev. 31 May 60, 18p. Secondary Standards Lab. Instrument Calibration Procedure AG-13, supersedes AG-23.

DESCRIPTORS: Radiofrequency, *Oscillators, Calibration, Instrumentation

The Test Instrument is a compact oscillator which produces frequencies from 250 to 920 megacycles.

PB 171 748 $0.50

Bureau of Naval Weapons, Washington, D. C.
UNIT OSCILLATOR GENERAL RADIO 1214A. BuWeps-BuShips Calibration Program. 17 Dec 58, 9p. Secondary Standards. Lab. Instrument Calibration Procedure AG-10.

DESCRIPTORS: Radiofrequency, *Oscillators, Calibration, Instrumentation.

The Test Instrument is an audio oscillator which produces two fixed frequencies.

PB 171 736 $0.50

Bureau of Naval Weapons, Washington, D. C.
VIDEO AMPLIFIER HEWLETT PACKARD 526A. BuWeps-BuShips Calibration Program. 7 Nov 58, 11p. Secondary Standards Lab. Instrument Calibration Procedure AF-03, supersedes AF-12.

DESCRIPTORS: *Video amplifiers, Calibration, Instrumentation, Amplifiers

The Test Instrument is a plug-in amplifier used to increase the sensitivity of a basic electronic counter unit. A video output is provided to monitor the input waveform visually.

PB 171 761 $0.50

Bureau of Naval Weapons, Washington, D. C.
VOLTAGE STANDING WAVE RATIO, G-BAND (3.95 TO 5.85 KMCPS) 1.00:1 TO 10:1. BuWeps-BuShips Calibration Program. 18 Dec 59, 13p. Secondary Standards Lab. Measurement System Operation Procedure HV-03.

DESCRIPTORS: *Voltage, *Standing wave ratios, G-band, Measurement, Calibration, Instrumentation.

This procedure utilizes the slotted line technique for the measurement of voltage standing wave ratio. A slotted section, crystal detector, and tunable probe are used to detect standing waves in the line. The detected voltage is fed to a linear amplifier and meter whose scale is calibrated so that when the pointer is adjusted to full scale with the probe resting on a voltage maximum, the VSWR may be read directly when the probe is moved to a voltage minimum.

PB 171 760 $0.50

Bureau of Naval Weapons, Washington, D. C.
VOLTAGE STANDING WAVE RATIO X-BAND (8.2 TO 12.4 KMCPS) RANGE: 1.00:1 TO 10:1. BuWeps-BuShips Calibration Program. 9 Sep 58, 13p. Secondary Standards Lab. Measurement System Operation Procedure HV-01.

DESCRIPTORS: *Voltage, *Standing wave ratios, X-band, Measurement, Calibration, Instrumentation.

A slotted line technique is used for the measurement of a voltage standing wave ratio as follows: A 1-Kc square-wave modulated signal source, a slotted section, a crystal detector, and a tunable probe are used to detect standing waves on the line. The detected voltage is applied to an amplifier and a meter scale which is calibrated when the pointer is adjusted to full scale with the probe set at a voltage maximum, the VSWR may then be read directly when the probe is moved to a voltage minimum.

PB 156 464 $10.10

Electrical Engineering Research Lab., U. of Illinois, Urbana.
CLOSELY SPACED TRANSVERSE SLOTS IN RECTANGULAR WAVEGUIDE, by Richard F. Hyneman. Technical rept. no. 14 on Contract AF 33(616)3220. 20 Dec 56, 126p. 26 refs. AD-127 455.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Waveguides, *Waveguide slots, Fourier analysis, Attenuation, Wave transmission.

The traveling wave modes associated with the infinite, periodic structure consisting of closely spaced transverse slots in rectangular waveguide are considered. An approximate equation for the propagation constants of these modes for the case of infinitesimal thickness of the slotted wall is derived through Fourier Analysis techniques and an approximate application of the Reaction Concept. Theoretical results are given for two special cases, (a) discretely spaced slots which extend completely across the broad face of the waveguide, and (b) infinitesimally spaced slots of arbitrary length. In the homogeneous case considered, it is found that two dominant modes may exist, an attenuated fundamental mode representing a perturbation of the dominant TE_{10} mode in closed rectangular waveguide, and an unattenuated surface wave, with phase velocity less than that of free space, which is similar to the wave associated with a corrugated surface waveguide. Essentially inde-

pendent control of the attenuation constant and phase velocity of the fundamental mode is possible over a wide range through the appropriate variation of the various physical parameters. Curves are given for the propagation constant in terms of these parameters, and the results of experimental measurements are shown to be in close agreement with the theory. (Author)

PB 156 465 $3.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
DISTRIBUTED COUPLING TO SURFACE WAVE ANTENNAS, by Ralph Richard Hodges, Jr. Technical rept. no. 15 on Contract AF 33(616)3220. 5 Jan 57, 33p. 2 refs. AD-127 454.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Waveguides, *Waveguide couplers, *Coupled antennas, Antenna couplers, Slot antennas, Attenuation, Antennas.

This investigation concerns the excitation of a traveling wave in a dielectric filled rectangular channel in an infinite ground plane, by means of distributed coupling to a closed waveguide. The data show some of the effects of the size of the coupling holes and the length of the coupling region upon (1) the attenuation between the input and output of the exciting waveguide, (2) the aperture distribution, and (3) the radiation pattern, for various frequencies. (Author)

PB 155 452 $3.60

Electronics Research Labs., U. of California, Berkeley.
CONVOLUTION Z-TRANSFORM METHOD TO CERTAIN NONLINEAR DISCRETE SYSTEMS, by E. I. Jury and M. A. Pai. Rept. on Contract AF 18(600)1521. 18 Jan 61, 31p. 11 refs. IER Series no. 60, issue no. 341; AFOSR-200; AD-252 737.

DESCRIPTORS: *Electronic circuits, *Electrical networks, Analysis, Synthesis, Feedback amplifiers, Feedback oscillators, Data, Integral transforms, Equations.

The convolution z-transform method is applied to obtain an explicit solution of certain nonlinear difference equations. The explicit solution is often desired for system design as well as for obtaining the response for large intervals of time. In these difference equations which describe the physical discrete systems, it is assumed that the nonlinearities are small. This is necessitated by the form of solution applicable to the use of the convolution method. The advantage of the method is to systematize the procedure for the solution as well as to obtain results in a closed form. The convergence of the solution is discussed as well as applications to certain examples. The examples chosen are feedback sampled-data systems with nonlinearities in the forward and feedback paths, respectively. Explicit solution in a closed form is obtained for the error as well as the output response. These results compare favorably with the numerical solution of the nonlinear difference as a recurrence relationship. (Author)

PB 155 360 $4.60

Electronics Research Lab., U. of California, Berkeley.
DESIGN OF LOSSY FILTERS BY DIGITAL COMPUTER, by S. K. Mitra and C. A. Desoer. Rept. on Contract AF 18(600)1521. 22 Dec 60, 42p. 12 refs. IER Series no. 60, issue no. 338; AFOSR-201; AD-253 175.

DESCRIPTORS: *Radiofrequency filters, Design, *Programming, *Digital computers, Synthesis, Mathematical analysis, Electronic circuits, Electrical networks.

Non-availability of ideal or dissipationless elements is a major drawback in the development of filters having some prescribed magnitude characteristic. In this paper, a simple and straight-forward design procedures using high-speed digital computer as the main tool is presented, for designing lossy filters built with lossy elements having unequal dissipation factors with no restriction on the amount of losses of the elements. The main idea is to perturb the elements so that the difference between the magnitude characteristics of the ideal filter and the corresponding lossy one at some discrete frequencies is minimized in the least-squares sense. The mathematical basis is first presented and then the results of using the suggested method in designing a lossy Chebyshev filter are discussed. (Author)

PB 155 806 $2.60

Electronics Research Lab., U. of California, Berkeley.
STABILITY OF NONLINEAR SAMPLED-DATA CONTROL SYSTEMS, by S. Kodama. Rept. on Contract AF 18(600)1521 and National Science Foundation G-12142. 20 Dec 60, 29p. 9 refs. IER series no. 60, issue no. 336; AFOSR-270; AD-254 693.

DESCRIPTORS: Control systems, Stability, *Servo systems, Servomechanisms, Analysis, Sampling, Matrix algebra.

Contents:
Two kinds of linearization
  Total linearization
  Incremental linearization
Statement of conjectures
  Conjecture 1
  Conjecture 2
Construction of counter examples
  General analysis of the system
  Counter example to conjecture 1
  Counter example to conjecture 2
Sufficient conditions for asymptotic stability in the large

PB 155 485 $1.60

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena.
CONSIDERATION OF SOME ELECTRONIC COMPONENTS IN SHOCK TUBE INSTRUMENTATION, by T. A. Jacobs. Technical rept. no. 2 on Contract AF 49(638)984. Feb 61, 16p. 6 refs. AFOSR-285; AD-253 461.

DESCRIPTORS: *Electronic equipment, Shock, *Shock tubes, *Infrared detectors, Detection, *Detectors, *Photomultipliers, Measurement, *Ultraviolet detectors, Infrared radiation, Ultraviolet radiation, Instrumentation, Test equipment.

Descriptions are presented of certain electronic components employed during the course of shock tube radiation measurements. Radiation detectors, including infrared, visual and ultraviolet, are discussed. Shock velocity measurements are presented. (Author)

PB 154 963 $1.60

Mound Lab., Miamisburg, Ohio.
NUCLEAR BATTERY, THERMOCOUPLE TYPE, by Bertram C. Blanke. Quarterly rept. no. 3, 2 July-30 Sep 57, on Contract R-50-799965-sc-01-91. 30 Sep 57, 15p. MLM-CF-57-10-31; AD-147 215.

This report released for sale to the public 28 June 61.

DESCRIPTORS: *Radioactive batteries, Design, Construction.

A second thermoelectric generator consisting of unitized rings of thermopiles was designed and constructed. Three and four rings were assembled into generators and tested. A maximum efficiency of 0.67% was obtained. At a ΔT of 400°C, an efficiency of 0.56% was obtained; the theoretical maximum for the materials used is 0.83%. (Author)

PB 156 323 $12.00

Polytechnic Research and Development Co., Inc., Brooklyn, N. Y.
BROADBAND WAVEGUIDE TRANSMISSION SYSTEMS AND COMPONENTS, by Max Sucher. Final rept. 1 July 47-31 Aug 49, on Contract NObsr-39294. [1949] 165p. 6 refs. Rept. no. 8.2.

This report released for sale to public 26 June 61.

DESCRIPTORS: *Broadband, *Waveguides, Microwave frequency, *Transmission lines, Dielectric properties, Waveguide filters, Microwave amplifiers, Microwave oscillators, Microwave equipment.

This report includes the investigation of a number of broadband guide geometries such as ridged, dielectric foreshortened, and bowtie guide. In addition, work done on a number of broadband devices such as a wideband mode filter, bolometer mount and oscillator cavity is described. Investigation of the properties of a low-loss microwave transmission line in the form of a dielectric guide and its uses as a directive radiator is included. Finally, distributed amplification is considered as a means of obtaining wideband amplifiers at microwave frequencies. (Author)

PB 155 213 $2.60

Republic Aviation Corp., Farmingdale, N. Y.
SYNTHESIS OF CURRENT WAVEFORMS BY TYPE C NETWORKS, by D. Rigney, L. Kraus, and H. Malamud. Rept. on Contracts AF 29(601)2866 and AF 49(638)552. 30 Jan 61, 27p. 4 refs. PPL-TR-61-4 (258); AFOSR-321; AD-252 395.

DESCRIPTORS: *Electric currents, Inductance, Synthesis, Wave analysis, Harmonic analysis, Programming, Digital computers, *Plasma jets, Thermonuclear experiments

A theoretical analysis is performed which permits synthesis of any required current waveform when the current is to be discharged through a load inductance, L. The synthesis is accomplished by forcing the characteristic modes of an LC network into correspondence with the harmonic components of the required waveform. Equations are derived which permit solution for the required network parameters, and approximate solutions are given. An IBM 7090 program is available for use when more accurate solutions are required. The experimental synthesis of a current waveform is described. (Author)

PB 156 541 $12.50

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
QUARTERLY PROGRESS REPORT NO. 48 FOR PERIOD ENDING 30 NOVEMBER 1957, by J. B. Wiesner, G. G. Harvey and H. J. Zimmermann. Rept. on Contract DA 36-039-sc-64637. 15 Jan 58, 179p. 79 refs: AD-156 161.

This report released for sale to the public 30 June 61.

DESCRIPTORS: *Electronics, *Microwaves, Microwave spectroscopy, Nuclear magnetic resonance, Stroboscopes, Frequency modulation, Communications theory, Thermodynamics, Data transmission systems, Data processing systems, Transistors, Diodes, Speech, Analysis, Circuits, Theory, Gas discharges.

Contents:
Physical electronics
Microwave gaseous discharges
Solid state physics
Microwave spectroscopy
Nuclear magnetic resonance and hyperfine structure
Microwave electronics
Atomic beams
Stroboscopic research
Frequency modulation
Statistical communication theory
Process analysis and synthesis
Processing and transmission of information
Transistor and diode studies
Noise in electron devices
Statistical thermodynamics
Speech analysis
Mechanical translation
Communications biophysics
Neurophysiology
Circuit theory
Network synthesis
Microwave theory
Mathematics

PB 156 542 $10.50

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
QUARTERLY PROGRESS REPT. NO. 51 FOR PERIOD ENDING 31 AUGUST 1958, by J. B. Wiesner, G. G. Harvey, and H. J. Zimmermann. Rept. on Contract DA 36-039-sc-64637. 15 Oct 58, 136p. 97 refs.

This report released for sale to the public 30 June 61.

DESCRIPTORS: *Electronics, *Microwaves, Microwave spectroscopy, Gas discharges, Nuclear magnetic resonance, Stroboscopes, Frequency modulation, Communications theory, Thermodynamics, Data transmission systems, Data processing systems, Transistors, Diodes, Speech, Analysis, Circuits, Theory.

Contents:
Physical electronics
Microwave gaseous discharges
Plasma dynamics
Solid state physics
Thermoelectric processes and materials
Microwave spectroscopy
Nuclear magnetic resonance and hyperfine structure
Microwave electronics
Atomic beams
Frequency modulation
Statistical communication theory
Stroboscopic research
Statistical thermodynamics
Physical acoustics
Speech communication
Communications biophysics
Network synthesis
Circuit theory

SC-4573(RR) $1.75

Sandia Corp., Albuquerque, N. Mex.
DEVELOPMENT OF DESIGN CRITERIA FOR RELAYS. Final rept. 1 Feb 60-31 Jan 61. May 61, 62p.

PB 150 193 $4.60

Stanford Electronics Labs., Stanford U., Calif.
SOLID-STATE ELECTRONICS RESEARCH. Consolidated quarterly status rept. no. 7, 1 Apr-30 June 60, on Contracts Nonr-225(31), 225(44), 225(24), DA 36-039-sc-78272, 36-039-sc-73178, 36-039-sc-78296, and AF 33(616)6207. 1960, 42p. 21 refs. AD-241 646.

DESCRIPTORS: *Scientific research, Electronics, *Solids, Electronic equipment, Electron tubes, Semiconductors, *Transistors.

PB 155 300 $10.10

Stanford Electronics Labs., Stanford U., Calif.
STUDIES OF SOLAR MICROWAVE EMISSION USING A HIGHLY DIRECTIONAL ANTENNA, by G. Swarup. Scientific rept. no. 13 on Contract AF 18(603)53. 6 Feb 61, 122p. 73 refs. AFOSR-265; AD-252 915.

DESCRIPTORS: *Antennas, Solar energy, *Radio astronomy, *Microwaves, Analysis

Contents:
Theory of phase-switched interferometers
The Stanford microwave spectroheliograph antenna
Phase adjustment of large antennas
Spectroheliograms at a wavelength of 9.1 cm
The quiet sun
The slowly varying component from active regions

PB 156 578 $1.60

Wilmotte, Raymond M., Inc., Miami, Fla.
INSTANTANEOUS CROSS-CORRELATOR. Letter rept. no. 15 on Contract AF 30(602)1494. 19 June 57, 17p. Rept. no. 1037; RADC-TN-57-347; AD-131 307.

This report released for sale to the public 30 June 61.

DESCRIPTORS: *Statistical functions, *Light communication systems, Light, Modulation, Delay lines, Optical systems, Video signals.

Measurements were carried out on all units of the cross-correlator. A complete structure was built which comprised two ten inch delay lines, the sonic wave in one delay line traveling upward and that of the other delay line traveling downward. An optical system producing a narrow slit of light having the approximate dimensions of the delay lines used was employed with the result that, when both delay lines were fed with a complex signal, the complete correlation function was displayed on a screen. Figure 1 is a photograph of the experimental equipment used with which it was possible to photograph the cross-correlation function and to perform the measurements described below. The complex signal used was formed by a random noise generator followed by a filter having a flat frequency response from 375 to 425 kc. Both of these units are described in Report No. 14. The only difference in the present equipment and that described in Report No. 14 is that the center frequency of the filter was adjusted to 400 kc instead of the center frequency of 425 kc used in that report. (Author)

Ordnance, Missiles, and Satellite Vehicles

PB 154 927 $3.60

Avco Corp., Nashville, Tenn.
DESIGN, DEVELOPMENT AND FABRICATION OF A LIGHT WEIGHT AIRFRAME. Monthly progress rept. no. 8 for Dec 60 on Contract DA 33-008-ORD-1968. 15 Jan 61, 31p; AD-251 432.

DESCRIPTORS: *Airframes, *Guided missile noses, Aluminum alloys, Honeycomb cores, Design, Explosive forming, Welding, Welded joints, Rocket noses

The structural arrangement was established based on Al honeycomb construction (alloy X2020) which satisfied optimum requirements of weight, shell stability, aerodynamic smoothness, deflection, and strength criteria. A specification was developed for an adhesive bonding

system. The explosive forming method selected for manufacturing the face sheets required that the detail parts be rolled to a cone shape and seam welded. A specification was developed for the production resistance fusion welding of the X2020 alloy. However, difficulty was experienced in obtaining a satisfactory weld at the splice line of the cone shaped blanks used for explosive forming the skins. An alternate method chosen was to stretch-form the face sheets in 2 halves and join the 2 halves by adhesive bonding. Fabrication of the second airframe included the installation of: (1) the P/N TA-34-200 forward bulkhead; (2) the P/N TA-34-313D adapter; and (3) the P/N TA-34-138 nose tip. A technique was developed for the installation of the TA-34-200 forward bulk to provide an electrical conductivity bond between the bulkhead and the outside face sheet of the honeycomb skin.

PB 156 932 $1.60

Bureau of Mines, Pittsburgh, Pa.
STUDIES ON DEFLAGRATION TO DETONATION IN PROPELLANTS AND EXPLOSIVES, by C. M. Mason, F. C. Gibson and others. Quarterly rept. for 1 Jan-31 Mar 59. [1959] 17p. 4 refs. ARPA Order no. 44-59; AD-215 614.

DESCRIPTORS: *Propellants, *Explosives, *Detonation, Detonation waves, *Propellant grains, *Solid rocket propellants, Propagation, Test methods.

Instrumental methods were developed and applied to the composite-type Polaris propellant, high explosives, and solid oxidizer-liquid fuel mixtures. The necessity for adequate means to examine the phenomenon required that primary emphasis be given to the development of a system for the continuous determination of the propagation velocity in opaque materials under high degrees of total confinement. The method developed embodied the use of a resistance element placed axially in the burning grain, the resistance decreasing as the burning or detonating front moves down the charge. The output voltage, which decreases as the resistance decreases, is recorded oscillographically. Analysis of the record yields the location of the front and the velocity of propagation at any given time subsequent to initiation.

PB 156 933 $1.60

Bureau of Mines, Pittsburgh, Pa.
STUDIES ON DEFLAGRATION TO DETONATION IN PROPELLANTS AND EXPLOSIVES, by C. M. Mason, F. C. Gibson and others. Quarterly rept. for 1 Apr-30 June 59. 14 Aug 59, 13p. 2 refs. ARPA Order no. 44-59; AD-225 158.

DESCRIPTORS: *Propellants, *Explosives, *Detonation, Detonation waves, Tetryl, Nitroglycerin, Nitrates, Glycols, Ethylenes, PETN, RDX, Propagation.

Emphasis was given to studies on composite propellants and on liquid explosives initiated by weak shock waves under conditions somewhat similar to those used in card-gap testing. The character of the incident pressure pulses was standardized and amplitudes measured. In addition, some acoustic properties of the shock attenuator were determined. (See also PB 156 932)

PB 156 934 $1.60

Bureau of Mines, Pittsburgh, Pa.
STUDIES ON DEFLAGRATION TO DETONATION IN PROPELLANTS AND EXPLOSIVES, by C. M. Mason, F. C. Gibson and others. Quarterly rept. for 1 July-30 Sep 59. 4 Dec 59, 13p. 1 ref. ARPA Order no. 44-59; AD-229 604.

DESCRIPTORS: *Propellants, *Explosives, *Detonation, Test methods, Detonation waves, Propagation, Combustion, *Propellant grains, *Solid rocket propellants.

Studies are being made to establish methods for evaluating the detonability of solid propellants. Tests were made on a Polaris-type composite propellant to verify that detonation of the unmodified material is possible by boosting the grain with a modified composite propellant under conditions of high confinement. A plug of propellant 5 cm long and 2.9 cm in diameter was placed at the bottom of 17-cm cavity and initiated by chopped-repacked composite propellant having a density of 1.5 g/cc which in turn was initiated by a 14-g tetryl booster. The velocities were 2.8 mm/μsec for the terminal propagation in the chopped material and 3.7 mm/μsec for the solid plug. Plugs which were slit and filled with NH_4ClO_3 or sand produced essentially the same results. Tests without the chopped booster produced, instead of a detonation, propagation of sonic magnitude with an indicated rate of 1.5 mm/μsec. When the grain length was doubled, the propagation suddenly ceased at a distance slightly greater than that shown for 5-cm length. An experiment with a layer of chopped propellant between two 5-cm plugs produced a reactive wave which traversed the entire column. The reaction showed a tendency to cease in the first plug but was reestablished. (See also PB 156 933)

PB 156 935 $2.60

Bureau of Mines, Pittsburgh, Pa.
STUDIES ON DEFLAGRATION TO DETONATION IN PROPELLANTS AND EXPLOSIVES, by C. M. Mason, F. C. Gibson and others. Annual summary rept. 1 Jan-31 Dec 59. 23 Mar 60, 21p. 6 refs. ARPA Order no. 44-59; Rept. no. 3769; AD-234 712.

DESCRIPTORS: *Propellants, *Explosives, *Detonation, Test methods, Detonation waves, Propagation, Combustion, *Propellant grains, *Solid rocket propellants.

A resistance element method was developed and applied to studies on propellants and explosives. This electrical method utilizes the reduction in resistance of a probe placed in a material to determine the presence and development of a reactive propagation wave. An oscillographic record of the rate of propagation of the wave is provided which when analyzed yields the location of the ionized zone and its axial velocity of propagation along the probe. To determine the pressure pulse required to initiate a modified composite propellant, porous propellants grains were tested with rubber barriers to attenuate the incident shock. A 6-mm-thick inert barrier with acoustic impedance similar to the propellant permitted such efficient transfer of energy as to give instantaneous detonation; no detonation occurred with a 20-mm-thick barrier. Terminal propagation velocities of 2.8 and 3.7 mm/μsec were obtained for chopped material and a solid plug, respec-

tively, in tests on a composite Polaris-type propellant. When the grain length was increased to 10 cm, the propagation ceased suddenly at a distance slightly greater than that for a 5-cm length. In studies on liquid explosives, the detonation activity of the nitroglycerin-nitroglycol and nitroglycerin-ethylene glycol dinitrate systems was investigated. The data indicated that certain viscous liquids, capable of exothermal reactions, may decompose by mechanisms other than that recognized in the steady-state hydrodynamic concept where complete reaction is realized in a narrow zone. (See also PB 156 934)

PB 156 936 $1.10

Bureau of Mines, Pittsburgh, Pa.
STUDIES ON DEFLAGRATION TO DETONATION IN PROPELLANTS AND EXPLOSIVES, by F. C. Gibson, C. R. Summers, and F. H. Scott. Quarterly rept. for 1 Jan-31 Mar 60. 20 Apr 60, 9p. 3 refs. ARPA Order no. 44-59; AD-235 943.

DESCRIPTORS: *Propellants, *Explosives, *Detonation, Test methods, Detonation waves, Propagation, Combustion, *Propellant grains, *Solid rocket propellants, Photographic analysis.

Consideration was given to the problem of determining the susceptibility of solid propellants to detonate, namely, the ease of transition from deflagration to detonation. Wave shapes were studied of the shock waves resulting from initiators which had been used in detonation studies with unmodified Polaris propellant. Two probes were placed in a plane normal to a charge configuration, one at the axis and the other 1.25 cm off the axis. The front curvature of the wave was determined by measuring the difference in arrival time of the front at these points. Results indicated that a deterioration of the wave shape may be the cause for cessation of the propagation in solid, unmodified composite propellants. A study was made of a similar phenomenon in the detonation of liquid explosives. Fifteen shots were made using nitroglycerin-ethylene glycol dinitrate charges in various configurations. The charge parameter variations included length, diameter, wall material, and barrier material. The detonations were analyzed by use of the Cordin high-speed framing camera. Sonic disturbances persisted for periods of about 50 μsec in the shock-excited liquid explosive before any evidence of luminous reaction occurred. During this period, compression waves traveled through the confining wall and the liquid explosive, and resulted in cavitation. The compression of the vapor-filled cavities caused a gas phase reaction which expanded the cavity. When a cavity collapsed, a shock wave emerged which compressed adjacent cavities and caused a partial reaction to develop in the body of the explosive. (See also PB 156 935)

PB 156 937 $2.60

Bureau of Mines, Pittsburgh, Pa.
STUDIES ON DEFLAGRATION TO DETONATION IN PROPELLANTS AND EXPLOSIVES, by F. C. Gibson, C. R. Summers, and F. H. Scott. Quarterly rept. for 1 Apr-30 June 60. 28 July 60, 23p. 6 refs. ARPA Order no. 44-59; AD-241 006.

DESCRIPTORS: *Propellants, *Explosives, *Detonation, Propagation, Detonation waves, *Propellant grains, *Solid rocket propellants, Photographic analysis, Tetryl, TNT, Boosters, Nitroglycerin, Nitrates, Test methods, Combustion, Heat.

CARD-CAP TEST: Photographic analyses were made of detonation sequences in nitroglycerin-ethylene glycol dinitrate mixtures. The shock waves from a tetryl donor was attenuated by an inert barrier before transmission into the liquid explosive column. In one phase, the shock wave moved as a nonluminous disturbance up the column at 1.6 mm/μsec. INITIATION STUDIES USING THE RESISTANCE ELEMENT METHOD: Attenuated shock wave initiation by high explosive donors was studied with pouring density tetryl in plastic vessels and unconfined tetryl pellets. The fact that axial initiation precedes peripheral initiation under these circumstances was confirmed for granular tetryl. HEAT PULSE HYPOTHESIS OF INITIATION: Granular tetryl charges contained in 23-mm-id plastic vessels and rubber barriers were employed. For a 2.5-cm rubber barrier and 14-g tetryl booster, a delay time of 15μsec was established. Charge lengths were varied to provide shock travel distances equal to and less than that required for high-order detonation. Some support for the heat pulse hypothesis was evident in the rapid resistance drop after the initiation delay period. SOLID PROPELLANTS: A critical diameter test on granular TNT (density = 0.75 g/cc) was made. A conical cellulose acetate vessel was instrumented with a resistance element, filled with the explosive, and initiated with a pressed tetryl booster. A steady-state velocity of detonation of 3.9 mm/μsec resulted until the propagation reached a point on the charge axis, 6 cm from the charge end (diam = 1 cm). Here the detonation began to decay, and the propagation ceased at 3.18 cm from the end (diam = 0.56 cm). (See also PB 156 936)

PB 156 938 $1.60

Bureau of Mines, Pittsburgh, Pa.
STUDIES ON DEFLAGRATION TO DETONATION IN PROPELLANTS AND EXPLOSIVES, by F. C. Gibson, C. R. Summers, and F. H. Scott. Quarterly rept. for 1 July-30 Sep 60. 27 Oct 60, 16p. 3 refs. ARPA Order no. 44-61; AD-246 045.

DESCRIPTORS: *Propellants, *Explosives, *Detonation, Detonation waves, Propagation, Photographic analysis, Propellant grains, Nitroglycerin, Solids, Liquids, Tetryl, Shock waves, Combustion, Sensitivity.

Photographs of large (about 5 mm) bubbles of Ar and N in a liquid explosive where a 2.6-cm rubber barrier and a 14-g tetryl booster were employed showed that the presence of large bubbles did not serve as nuclei for initiation; no exothermal reaction resulting in expansion of the bubbles was discernible. The shock wave in the Ar bubble produced considerable luminosity but not in the N bubbles. Bubbles created by an electromagnetic vibrator in a liquid explosive also failed to serve as a locus for initiation. A free-falling column of NG-EGDN with a diameter of about 8 mm was found to propagate a detonation at the anticipated hydrodynamic velocity. The critical grain size for sustaining steady-state detonations of an unconfined high-performance double-base propellant initiated by direct shock wave was found to be above that in which a minimum circle of

4 mm diameter could be inscribed. The presence of an axial resistance element (wire) had no effect on the rate of detonation but did increase the burning rate by about 8% in open-ended vessels. Tests on both high-performance double-base propellant and explosives were conducted by detonating a tetryl charge weighing up to 50 g within 3 cm of a bed of the propellant and a bed of RDX, each burning at atmospheric pressure. The sensitivity to transit to detonation was not enhanced by the presence of the burning front. (See also PB 156 937)

PB 156 939 $1.60

Bureau of Mines, Pittsburgh, Pa.
STUDIES ON DEFLAGRATION TO DETONATION IN PROPELLANTS AND EXPLOSIVES, by F. C. Gibson, C. R. Summers, and F. H. Scott. Quarterly rept. for 1 Oct-31 Dec 60. 13 Feb 61, 14p. ARPA Order no. 44-61; AD-251 153.

DESCRIPTORS: *Propellants, *Explosives, Ignition, Detonation, Propellant grains, Detonation waves, Pressure, Combustion, Tests.

Study is reported: (1) on initiation at the geometric center of a cubical propellant grain; (2) on confined propellant grains; and (3) on minimum diameter of propellant grain to sustain detonation. Success was achieved in establishing accelerating propagation rates of deflagration and detonation in a high-performance, double-base US Naval Propellant Plant propellant; a transition from deflagration to detonation could not be affected in the same experiment. It is known that the deflagration velocity increases with an increase in ambient pressure, therefore, it is assumed that there is some magnitude of pressure which is sufficient to affect this transition. (Author) (See also PB 156 938)

PB 156 940 $2.60

Inter-Range Instrumentation Group.
IRIG STANDARD TIME FORMATS. [1960] 28p. IRIG Document no. 104-60; AD-245 293.

DESCRIPTORS: *Guided missiles, *Spaceships, Satellite vehicles, Research program administration, Test facilities, Standardization, *Data processing systems, Data, *Pulse communication systems, Timing circuits, Coding, Standards, Digital systems, Magnetic recording systems, Circuits.

The purpose of this document is to present the details of the standardization work accomplished by the Timing Committee of the Tele-Communications Working Group, IRIG (Inter-range instrumentation group). A complete description of the IRIG-recommended standard, with exerpts from the timing glossary, is contained herein. Recommendation of a standard method of recording on magnetic tape and an example of electronic logic for recovery from tape are also included. Additional copies of this document are available through the office of the IRIG Secretariat. (Author)

PB 156 463 $19.75

Martin Co., Baltimore, Md.
DYNAMIC ANALYSIS AND DESIGN PERFORMANCE REQUIREMENTS FOR SATELLITE VEHICLE GUIDANCE SYSTEMS. Final engineering rept. on Contract AF 33(616)6040. 31 Jan 59, 336p. 50 refs. ER-10470-6; AD-211 181.

This report released for sale to the public 27 June 61.

DESCRIPTORS: *Satellite vehicle trajectories, *Guidance, *Orbital flight paths, Errors, Mathematical analysis

The results of a study, which covered the dynamic analysis of satellite vehicle trajectories are discussed. Background material and error analyses required to define design performance requirements of satellite vehicle guidance systems are presented. The material is of a general nature and includes all phases of the orbital mechanics of satellite systems.

PB 156 651 $33.50

Picatinny Arsenal, Dover, N. J.
COMPILATION OF DATA ON THE COMPATIBILITY OF EXPLOSIVES AND POLYMERS, by O. R. Abolafia. Rept. no. 1 on Stability and Reaction of Explosives. 1 Oct 51, declassified 30 Mar 61. 890p. Technical rept. no. 1838.

This report released for sale to the public 29 June 61.

DESCRIPTORS: *Explosives, *Polymers, Stability, Pyrotechnics, Propellants, Primers, Detonators, Tests, Chemical reactions.

This report is divided into three major sections. The first contains accelerated test data correlated with the results of long term storage tests. The second contains uncorrelated accelerated test data. Each of these sections treat only the effect of polymers on the stability of explosives. The third section is a compilation of test data which does not come under the outline of the preceding sections.

PB 171 516 $1.25

Rock Island Arsenal Lab., Ill.
THE USE OF VOLATILE CORROSION INHIBITORS AS A PRESERVATIVE MEDIUM FOR LONG TERM STORAGE OF ORDNANCE MATERIEL. ADDENDUM VII. RESULTS AFTER TEN YEARS OF EXPOSURE, by Robert E. Johnson. 9 Feb 61, 49p. 2 refs. Rept. no. 61-544; AD-256 595.

DESCRIPTORS: *Ordnance, Materials, Storage, Preservation, *Corrosion inhibition, Effectiveness.

Two volatile corrosion inhibitors and three petrolatum type corrosion preventives were evaluated after ten years in storage to determine their ability to prevent rusting of gun and howitzer tubes, recoil rods and

cylinders, sintered iron specimens, and nonferrous specimens, and to establish the total amount of residual inhibitor on the wrappers. The work indicated that there was no significant difference in the overall protective effectiveness of the two types of volatile corrosion inhibitors. Minor instances of rusting were observed throughout the program, however, these were erratic and did not justify any statement concerning the superiority of one over the other. It was shown that the inhibited papers and the corrosion preventives produced no significant adverse effects on the stored materiel. Inasmuch as the controls did not rust, the comparative protective ability of the inhibited papers and the corrosion preventives is not readily evident. Concerning the nonferrous specimens, little or no effect was noted on the majority of the specimen with both the inhibited papers and the corrosion preventives. The cadmium was affected by all, and most severely by one of the inhibited papers. The weight of loading values obtained showed no significant change from previous inspections. In the majority of cases, the inhibitor content was found to be similar to the original loading as stated by the manufacturer. The overall results indicated that the volatile corrosion inhibitors could be successfully utilized in the preservation of gun and howitzer tubes with a resultant savings in the time and labor required for preservation and packaging. (Author) (See also PB 136 144)

SCTM-103-61(71) $0.50

Sandia Corp., Albuquerque, N. Mex.
AN ECONOMICAL, LIGHTWEIGHT, FOAMED FIN FOR ROCKET APPLICATION, by T. M. Sedgwick. May 61, 12p.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

PB 155 277 $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
A PROBLEM IN EQUIPMENT MAINTENANCE, by George H. Weiss. Rept. on Contract AF 18(600)1315. Feb 61, 26p. 7 refs. Technical note BN-233 AFOSR-362; AD-252 680.

DESCRIPTORS: Machines, Maintenance, Matrix algebra, *Operations research, Probability, *Statistical processes, Reliability.

Availability of a group of mechanisms described by a lifetime distribution R(m) equals exp(-m/T). Various inspection schemes are assumed, and each inspection is assumed to be imperfect as regards to discovering mechanism failures. It is also postulated that inspection and repair require random amounts of time. The asymptotic availability of such mechanisms is calculated by means of the theory of semi-Markov processes. (Author)

Engines and Propulsion Systems

AD-256 701 repriced $3.50

Electro-Optical Systems, Inc., Pasadena, Calif.
ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK. VOLUME III: DYNAMIC THERMAL CONVERTERS, by C. W. Stephens, R. Spies, and W. R. Menetrey. Rept. on Contract AF 33(616)6791. Sep 60, 214p. 67 refs. EOS rept. 390-final; WADD Technical rept. 60-699, Vol. III.

DESCRIPTORS: Electrostatic generators, Heat transfer, Heat exchangers, *External combustion engines, *Steam turbines, Handbooks, *Spaceships

Volume III incorporates a detailed discussion of the two dynamic thermal converters which appear most useful in future power systems in the next decade, the Stirling engine and the Rankine cycle turbine. Empirical and theoretical equations are presented describing engine performance, and estimates are made of future performance possibilities with new working fluids, higher operating temperatures, etc. Also discussed are electrostatic and electromagnetic generators which are coupled with the dynamic thermoconverters. Anticipated weights, efficiencies and other performance characteristics are described. (Author)

AD-256 702 repriced $3.50

Electro-Optical Systems, Inc., Pasadena, Calif.
ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK. VOLUME IV: STATIC THERMAL CONVERTERS, by J. Blair and J. D. Burns. Rept. on Contract AF 33(616)6791. Sep 60, 210p. 43 refs. EOS rept. 390-final; WADD Technical rept. 60-699, Vol. IV.

DESCRIPTORS: *Thermionic emission, *Thermoelectricity, Handbooks, *Spaceships

Volume IV discusses two static thermal converters of prime interest to space power systems, the thermoelectric generator and the thermionic emitter. Empirical and analytical relations describing their performance are presented. Performance is optimized as a function of heat sink and source temperatures, material parameters available at present and anticipated in the future, and fabrication limitations. While the efficiencies of present devices are lower than obtainable with dynamic heat engines, anticipated material improvements will reverse this situation and result in converter efficiencies on the order of 30 to 40 per cent for thermionic emitters, and 25 to 30 per cent for thermoelectric generators within the next decade. (Author)

AD-256 881 repriced $4.00

Electro-Optical Systems, Inc., Pasadena, Calif.
ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK. VOLUME VII: HEAT EXCHANGERS, by A. Haire and L. Hays. Rept. on Contract AF 33(616)6791. Sep 60, 286p. 66 refs. EOS rept. 390-final; WADD Technical rept. 60-699, Vol. VII.

DESCRIPTORS: *Heat exchangers, Heat transfer, *Spaceships, Handbooks.

Volume VII presents empirical and analytical equations describing the performance of several types of heat exchangers useful in space power systems, including non-phase-change heat exchangers, condensers, boilers, sub-cooling mechanisms, and others. The present state-of-the-art concerning materials compatibility, fabrication techniques, knowledge of environmental deterioration, and other factors is presented. Anticipated weights and practical difficulties encountered in systems operation are discussed. (Author)

AD-256 882 repriced $2.75

Electro-Optical Systems, Inc., Pasadena, Calif. ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK. VOLUME VIII: OTHER DEVICES, by R. Wall, D. Erway and others. Rept. on Contract AF 33(616)6791. Sep 60, 145p. 50 refs. EOS rept. 390-final; WADD Technical rept. 60-699, Vol. VIII.

DESCRIPTORS: *Photoelectric transducers, Tracking, *Spaceships, Handbooks.

The performance characteristics are described of several auxiliary components useful in space power systems including orientation mechanisms, pumps, and static conversion and regulation devices. In addition, the MHD generator is analyzed as a thermal energy converter, and the possibilities of using beamed electromagnetic power are discussed. Weight, efficiency, power requirements, and other design characteristics of the auxiliary equipment are presented in empirical and analytical form. It is shown that beamed electromagnetic power does not appear useful until major breakthrough in antenna design and theory are achieved. The theoretical relations describing the MHD generator and the possibilities of its eventual use in thermal systems are described. (Author)

AD-256 748 repriced $2.25

Electro-Optical Systems, Inc., Pasadena, Calif. ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK. VOLUME IX: SOLAR SYSTEM DESIGN, by W. R. Menetrey. Rept. on Contract AF 33(616)6791. Sep 60, 97p. 4 refs. EOS rept. 390-final; WADD Technical rept. 60-699, Vol. IX.

DESCRIPTORS: *Photoelectric cells, Thermionic emission, *Spaceships, Handbooks

A summary is given of the anticipated performance of solar power systems over the next decade. This summary is based upon the analytical and empirical relationships describing component performance presented in Volumes II through VIII. Weight, cost, and reliability estimates are presented for photovoltaic power systems, and weight estimates are given for solar-thermal systems. Thermal converters include thermoelectric discs, thermionic emitters, turbo-generators, and the Stirling engine. (Author)

AD-256 884 repriced $2.75

Electro-Optical Systems, Inc., Pasadena, Calif. ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK. VOLUME X: REACTOR SYSTEM DESIGN. Rept. on Contract AF 33(616)6791. Sep 60, 125p. 31 refs. EOS rept. 390-final; WADD Technical rept. 60-699, Vol. X.

DESCRIPTORS: *Nuclear power plants, *Spaceships, Handbooks

Various aspects of reactor design are discussed with respect to inherent limitations and system requirements and many problems are outlined which are common to all nuclear systems such as shielding, reliability, heat rejection, and safety. (Author)

Machine Parts and Mechanisms

PB 156 317 $1.60

Naval Ordnance Plant, Indianapolis, Ind. CLEANING OF BALL BEARINGS, by Norton Gerber. Final rept. 23 Apr 54, 20p. 6 refs. Materials rept. no. 33.

This report released for sale to the public 28 June 61.

DESCRIPTORS: *Ball bearings, Cleaning, *Ultrasonics.

Individual ball bearings can be cleaned effectively with ultrasonic energy by either of two methods. Time has not permitted the investigation of continuous or batch cleaning methods. There is some evidence that ultrasonic cleaning equals at least one conventional method. Whether it equals or exceeds in efficiency most conventional cleaning methods remains to be determined. Most of the work described in the report has been exploratory. Torque testing techniques were worked out to obtain a valid torque chart, a method for analyzing torque charts was worked out as a consistent means for comparing results of different cleaning methods, and important information was obtained on techniques for applying ultrasonic energy in the cleaning procedure. A program for accelerated investigation has been proposed. This program contemplates checking reproducibility and accuracy of torque tests, determination of conditions for batch cleaning, evaluating differences in cleaning methods, and what influence the lubricant type and the lubricant application method have on the torque curve. (Author)

PB 156 318 $1.60

Naval Ordnance Plant, Indianapolis, Ind. INVESTIGATION OF BEARINGS FOR SYNCHROS, by J. G. Weir and John I. White. Progress rept. 29 June 55, 11p. 1 ref. Materials rept. no. 41.

This report released for sale to the public 28 June 61.

DESCRIPTORS: *Synchros, *Ball bearings, Tests.

This investigation of bearings for synchros was undertaken in an attempt to determine if different combinations of bearing materials and retainers affect the operation of a synchro. The tests reported herein do not cover all combinations of materials and retainers; however, of the materials and combinations tested, statistical analysis indicated a combined effect such that crown retainers with stainless steel bearings appeared the best of those considered. (Author)

PB 156 349 $11.50

Naval Ordnance Plant, Indianapolis, Ind.
STANDARDIZATION FOR TORQUE TESTING PRECISION INSTRUMENT BALL BEARINGS, ADDENDUM. 22 Apr 54, 153p. 7 refs.

This report released for sale to the public 28 June 61.

DESCRIPTORS: *Ball bearings, Torque, Friction, Test equipment, Standardization.

Contents:
Military standard: friction torque testing for instrument antifriction ball bearings; MIL-STD-206
Correlation study of torque testers for instrument precision ball bearings; Subtask progress rept. nos. 1 and 2.

PB 156 348 $1.10

Naval Ordnance Plant, Indianapolis, Ind.
A SYSTEM FOR TORQUE CHART ANALYSIS, by Norton Gerber. 27 May 54, 10p.

This report released for sale to the public 28 June 61.

DESCRIPTORS: *Ball bearings, Torque, Tests.

The system for torque chart analysis is based on the theoretically ideal chart, which is uniform, level, has a low magnitude, a low band-width, no torque peaks, and a low frequency of variation for the instantaneous torque. The median torque line, in gram-centimeters times 100, provides the basic demerit number and is the base from which all deviations are identified for the application of demerit points.

Transport, Traction and Hoist Facilities

PB 171 847 $0.75

Army Transportation Research Command, Fort Eustis, Va.
SCALE MODELS OF VEHICLES IN SOILS AND SNOWS, by C. J. Nuttall, Jr. (Wilson, Nuttall, Raimond, Engineers, Inc.) and Robert P. McGowan. 14 June 61, 27p. 14 refs. Research Technical memo. 33; TREC Technical rept. 61-50.

DESCRIPTORS: *Vehicles, *Snow vehicles, *Vehicle wheels, *Model tests, *Soils, Snow, Trafficability, Military research, Military transportation, Tires.

The history of research into the use of scale models to study vehicle performance in soils is reviewed. The current Transportation Corps research program in this field is outlined, and a method for characterizing soils and snows for scale-model test purposes growing out of this work is presented. Some correlations between scale-model and full-size performance in natural snow and sand terrains are given. Finally, design data on the performance of 4x4 pneumatic-tired vehicles in sand and snow are offered, together with appropriate information on probable minimum material strengths to be anticipated. The current dimensional analysis upon which the research is based is also presented. (Author)

PB 171 846 $1.25

Army Transportation Research Command, Fort Eustis, Va.
SCALED VEHICLE MOBILITY FACTORS (TIRES IN SAND) by Carlo J. Roma and Robert P. McGowan. Interim rept. no. 3 on Task 9R97-40-001-01, House Task 4.2, formerly Project 9-97-40-000, House Task 4.2. Apr 61, 47p. 6 refs. TREC Technical rept. 61-49; AD-254 813.

DESCRIPTORS: *Vehicles, Performance, *Model tests, *Tires, Sand, Trafficability, *Vehicle wheels.

The report covers comparative performance tests (drawbar pull, towing resistance, and sinkage) of a wide range of tire shapes utilized in a 4x4 wheeled-vehicle configuration. The tests were conducted at Fort Story, Virginia, during the summer of 1959. The performance data are expressed in dimensionless form and are applicable for all wheel sizes and vehicle weights in sand. Test results indicate that the scale model procedures described are practical for quickly evaluating wide ranges of sizes, weights, and configurations of vehicles for operation in sand. Prediction of the performance of any 4x4 wheeled vehicle can be made from the proper measurement of sand strength. The data at present are limited to vehicles with equal weight distribution on the wheels. It is also shown that it may be possible to interpret vehicle test data in sand in terms of vehicle performance in typical "difficult" snow. (Author)

MATERIALS

PB 171 683 $0.75

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
A STUDY OF HARD SURFACE DETERGENCY, by A. Mankowich. 17 Mar 61, 24p. 22 refs. CCL #103; AD-255 769.

DESCRIPTORS: *Detergents, Tests, Surface tension, *Wetting agents, Ethers, Glycols, Phenyl radicals, Metallic soaps, Ethylenes, Laurates, Fatty acid esters, Sulfonates, Sodium compounds, Potassium compounds

In a study of hard surface detergency using glyceryl trioleate soil with three types of nonionic and three

types of anionic syndets, only one surfactant (potassium laurate) of eleven showed maximum detergency at the CMC (critical micelle concentration). In general, soil removal at the CMC was low, about 40 percent. No significant changes were observed in micellar solubilization and interfacial tension at the CMC. On passing the CMC with increasing concentration, detergency and solubilization continued to increase sharply while interfacial tension continued to drop rapidly. Detergency began to level off at the 90 percent soil removal point, while at this point interfacial tension had attained a minimum in most cases or was within about 0.2 erg per sq. cm. of the minimum; solubilization continued to rise sharply. The suspending power of the nonionic surfactants at the 90 percent detergency point was at a minimum in most cases, or was very close to the minimum. The 90 percent detergency or CC-1 point appeared to be a characteristic point of the surfactants studied. The ratio, CC-1/CMC, varied with surfactant type. Closely related analogs had approximately the same ratio. A relationship was discovered in two series of analogs (polyethenoxyethers of nonyl phenol and polyethenoxyethers of tridecyl alcohol). It was found that the ratio of the HLB (hydrophile-lipophile balance) values of two analogs was equal approximately to the fifth root of the ratio of their CMC values. The correlation held for analogs varying by as much as 15 moles ethylene oxide. (Author)

PB 156 643 $2.60

Naval Radiological Defense Lab., San Francisco, Calif.
PROTECTIVE COATINGS FOR CONCRETE, by R. H. Heiskell and R. J. Crew. 16 May 57, 28p. 3 refs. Research and development technical rept. USNRDL-TR-148.

This report released for sale to the public 3 July 61.

DESCRIPTORS: *Concrete, Moisture-proofing, Coatings, Effectiveness, Decontamination.

Sample cubes of Portland cement mortar and Portland cement concrete were coated with experimental formulations and various commercially available protective coatings and sealers. These were tested for water absorption by immersion for 24 hr. Only 2 experimental formulations and 14 commercial coatings of the 66 tested reduced the water absorption by 90 per cent. Preliminary decontamination tests, in which La^{140} and Np^{239} were used as contaminants, indicated that coatings which showed the highest resistance to water absorption were, in general, the easiest to decontaminate. (Author)

TID-4900 $0.50

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
RARE EARTHS AND MONAZITE SANDS. A list of selected references to Technical Reports, Books and Journals, comp. by F. L. Sachs. 30 Mar 61, 6p.

Ceramics and Refractories

AD-255 278 repriced $0.50

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS ON OXIDATION-RESISTANT COATINGS FOR REFRACTORY METALS, by W. D. Klopp. 26 Apr 61, 5p. 7 refs. DMIC Memo. 102.

DESCRIPTORS: *Refractory materials, *Coatings, Antioxidants, Niobium, Tantalum, Molybdenum, Tungsten, Metal coatings, *Ceramic coatings, Intermetallic compounds, Vapor plating.

The memorandum reviews recent developments in oxidation-resistant protective coatings for the four refractory metals, columbium, tantalum, molybdenum, and tungsten. (Author)

LA-2521 $0.50

Los Alamos Scientific Lab., N. Mex.
PREPARATION OF MINUS 10 MICRON DENSE UO_2, by M. C. Tinkle, W. J. McCreary and others. Rept. on Contract W-7405-eng-36. July 60, 21p.

TID-7602(Pt. 1) $0.75

Oak Ridge National Lab., Tenn.
PROCEEDINGS OF THE BERYLLIUM OXIDE MEETING. Held at Oak Ridge National Laboratory, Oak Ridge, Tennessee, December 1-2, 1960. 41p.

SCNC-311 $1.00

Sylvania-Corning Nuclear Corp., Bayside, N. Y.
CERAMIC FUEL ELEMENTS MADE BY HOT ISOSTATIC PRESSING, by I. Sheinhartz and J. Fugardi. Rept. on Contract AT-30-1-GEN-366. Sep 60, 45p.

Y-1340 $1.25

Union Carbide Nuclear Co., Oak Ridge, Tenn.
THE COLD PRESSING OF SINTERABLE UO_2, by R. P. Levey, Jr. Rept. on Contract W-7405-eng-26. 15 Dec 60, 56p.

Fuels, Lubricants, and Hydraulic Fluids

BMI-1516 $1.25

Battelle Memorial Inst., Columbus, Ohio.
IRRADIATION-CAPSULE STUDY FOR SM-2 REFERENCE AND ALTERNATE DISPERSION FUELS, by D. B. Hamilton, J. F. Lagedrost and others. Rept on Contract W-7405-eng-92. 25 May 61, 48p.

OTS SB-459 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
LUBRICANTS, GREASES AND HYDRAULIC FLUIDS. May 61, 21p. 328 refs. OTS Selective Bibliography SB-459.

DESCRIPTORS: *Lubricants, *Greases, *Hydraulic fluids, *Bibliography.

Lists PB reports, AEC reports and translations added to the OTS collection from period 1956 to May 1961. This bibliography supplements CTR-21 on Synthetic Lubricants, CTR-322 on Lubricant Additives, and CTR-345 on Greases and Lubricants. Also covered are Hydraulic Fluids and Lubricating Oils, as well as Government-Owned Patents. Included are reports on high and low temperature lubricants and hydraulic fluids, liquid metals as power transmission fluids, radiation resistant oils, greases and lubricants, organometalloidal lubricants and hydraulic fluids, vinylic filler lubricants and greases, dry film and solid film lubricants. (Author)

DP-588 $0.50

Savannah River Lab., Aiken, S. C.
REPROCESSING OF POWER REACTOR FUELS, comp. by J. H. Owen. Quarterly progress rept. no. 14, 1 Jan-1 Apr 61, on Contract AT(07-2)-1. May 61, 12p.

Rubber and Elastomers

PB 171 517 $1.00

Rock Island Arsenal Lab., Ill.
AGING OF ELASTOMER VULCANIZATES AT TEMPERATURES UP TO 900°F, by E. W. Bergstrom. 9 Feb 61, 33p. Rept. no. 61-543; AD-256 596.

DESCRIPTORS: *Elastomers, *Vulcanizates, Aging, Temperature, Physical properties, Tests, Rubber.

The effect of prolonged exposure to high temperatures on the retention of physical properties by various isobutylene/isoprene, silicone and vinylidene fluoride/hexafluoropropylene vulcanizates was determined. Properly compounded isobutylene/isoprene vulcanizates showed good heat resistance for at least 28 days at 300°F, and certain silicone and vinylidene fluoride/hexafluoropropylene vulcanizates had good retention of physical properties after 28 days of aging at 500°F or 7 days of aging at 600°F. All vulcanizates had poor heat resistance when aged at 700°, 800°, and 900°F. A vinylidene fluoride/hexafluoropropylene vulcanizate did, however, have measurable physical properties after having been aged up to 5 hours at 700°F, 10 minutes at 800°F and 1 minute at 900°F. Certain of the silicone and vinylidene fluoride/hexafluoropropylene vulcanizates had better retention of physical properties when aged in a circulating air oven than when aged in test tubes. Ferric oxide improved the heat resistance of silicone vulcanizates, especially when these were test tube aged. (Author)

PB 156 322 $1.60

Rock Island Arsenal Lab., Ill.
INFRARED SPECTROSCOPY OF POLYMERS. A LITERATURE SURVEY, by Ronald Freeman. Rept. no. 11 on Rubber Problems. 3 Mar 54, 18p. 31 refs. RIA Lab. no. 54-849; AD-34 897.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Polymers, Spectrographic analysis, *Infrared spectroscopy, Bibliography, Molecular structure, Deterioration, *Rubber.

A search of the Chemical Abstracts for the past 10 yr revealed that IR spectrographic techniques can be applied to identification and determination of the molecular structure of polymers and serve as a means for an estimation of the deterioration of polymers.

MATHEMATICS

PB 155 509 $6.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
CLASSIFICATIONS OF RECURSIVE FUNCTIONS BY MEANS OF HIERARCHIES (I). CORRECTION TO TRANSFINITE RECURSIVE PROGRESSIONS OF AXIOMATIC THEORIES (II). NON-UNIQUENESS RESULTS FOR TRANSFINITE PROGRESSIONS (III) by Solomon Feferman and G. Kreisel. Technical rept. nos. 2 and 4 on Contract DA 04-200-ORD-997. 22 Feb 61, 64p. 19 refs. OOR repts. 2379:2, 2379:6 and 2379:7; AD-252 160.

DESCRIPTORS: Mathematical logic, *Functions.

PB 154 796 $1.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ON FITTING A LINEAR TREND AND TESTING INDEPENDENCE WHEN THE RESIDUALS FORM A MARKOV PROCESS, by V. K. Murthy. Technical rept. no. 6 on Grant DA-ORD-43. 22 Nov 60, 17p. 4 refs. OOR rept. 2025: 6-M; AD-250 324.

DESCRIPTORS: Numerical analysis, *Statistical processes, *Statistical tests, Numerical methods and procedures, Least squares method.

A study was conducted on the problem of fitting a linear trend when the residuals are serially correlated according to a first order Markov scheme. An iteration method for solving the maximum likelihood equations is proposed and an explicit criterion for the convergence of the iteration process is obtained. (Author)

PB 155 308 $1.60

California U., Los Angeles.
ON THE APPLICATION OF LYAPUNOV'S SECOND METHOD TO THE SYNTHESIS OF NONLINEAR CONTROL SYSTEMS, by A. Stubberud, C. T. Leondes, and M. Margolis. Rept. on Adaptive Control Systems, Contract AF 49(638)438. Jan 61, 14p. 2 refs. Dept. of Engineering rept. no. 61-3; AFOSR-218; AD-252 814.

DESCRIPTORS: *Control systems, Stability, *Differential equations, Synthesis.

An approach to the design of nonlinear compensation networks is presented. The design procedure is based on Lyapunov's second method, a method of examining the stability of a set of differential equations. A Lyapunov function is formed for the control system under question, and this function is then manipulated to minimize the system settling time. A method for generating Lyapunov functions for a particular class of feedback control systems is discussed. Some examples of the design procedure are presented. The chief merits of the design procedure are: (1) the nonlinear system which is determined will not introduce instability into the system; and (2) the nonlinear differential equations of the system need not be solved; thus eliminating many of the computational difficulties associated with nonlinear design. (Author)

PB 154 731 $2.60

Case Inst. of Tech., Cleveland, Ohio.
THE FOLDED NORMAL DISTRIBUTION, by F. C. Leone, L. S. Nelson (General Electric Lamp Div.) and R. B. Nottingham (North Electric Co.). Rept. on Contract AF 49(638)361. Jan 61, 22p. 1 ref. Case Statistical Lab. Pub. No. 1041; AFOSR-180; AD-251 168.

DESCRIPTORS: Probability, Statistical functions, *Distribution theory, *Industrial research.

The folded normal probability density function is considered, as it relates to the original normal population from which it came. Some maximum likelihood estimates are presented, followed by other estimating procedures which are simpler to handle. A table is given for the estimation of mu and sigma (the mean and standard deviation of the original normal) given an estimate of the ratio of mu sub f and sigma sub f (of the folded normal). A second table gives the areas of the folded normal for the values of T sub f from 0.0 to 7.0 for 18 different ratios of mu sub f to sigma sub f. An example of real camber data is presented with the appropriate estimation of the theoretical distributions. (Author)

PB 156 467 $9.60

Dynamic Analysis and Control Lab., Mass. Inst. of Tech., Cambridge.
TECHNIQUES OF TIME-DOMAIN SYNTHESIS FOR CONTROL SYSTEMS, by Carl W. Steeg. Rept. on Contract AF 33(616)3398. 30 Apr 57, 114p. 41 refs. Rept. no. 100; AD-138 309.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Control systems, Design, *Servomechanisms, Differential equations, Mathematical analysis, Functional analysis, Difference equations.

This report develops time-domain synthesis procedures that are not only simpler than many other control-system design procedures but also achieve better performance for many systems. A basic component in the control system synthesized is an extrapolator, or predictor, that operates to determine the value of a signal at some future time. The design of these extrapolators is explained in terms of a simplified linear analytical prediction theory, which attempts to bridge an apparent gap in technical literature. The purposes of the report are to assist in explaining in simple terms both the criteria significant in the design of control systems synthesized by time-domain methods and a definite analytical procedure for the determination of the controller properties necessary for the specified over-all system performance.

PB 154 790 $2.60

[Institute for Cooperative Research, Johns Hopkins U., Baltimore, Md.]
ON TWISTED TENSOR PRODUCTS OF ALGEBRAS, by V. K. A. M. Gugenheim. Rept. on Contract DA 36-034-ORD-2588 [1960] 24p. 5 refs. OOR rept. 1913:3-M; AD-252 488.

DESCRIPTORS: *Algebras, *Tensor analysis, *Algebraic topology.

Several results are obtained, including a proof of a theorem of Adams (Ann. of Math (1), 72, 1960), by means of a method entirely analogous to that used in the theory of twisted cartesian products of semisimplical complexes.

PB 155 491 $4.60

Institute of Tech., U. of Minnesota, Minneapolis.
ON HOLOMORPHIC FAMILIES OF FIBER BUNDLES OVER THE RIEMANNIAN SPHERE, by Helmut Röhrl. Rept. on Contract AF 49(638)885. [1960] 47p. 21 refs. AFOSR-432.

DESCRIPTORS: *Algebraic topology, Functions, *Mathematics.

PB 156 478 $8.60

Interaction Lab., Yale U., New Haven, Conn.
A SYSTEM OF COMBINATORY LOGIC, by Frederic B. Fitch. Technical rept. no. 9 on Problem Solving and Social Interaction, Contract SAR/Nonr-609(16). Nov 60 95p. 2 refs. AD-250 562.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Mathematical logic, Operators (Mathematics), Psychology.

Contents:
Functions
Remarks on functions
Functional notation of combinatory logic
The class of Q-functions
Boolean concepts and identity
Rules for negation, conjunction and disjunction
Rules for identity
Boolean identities
Combinators
The combinators I and K
The combinators C and T
The combinators B and W
Abstraction
Foundations of arithmetic
General properties of multiplication, addition, and exponentiation
The natural numbers
Universality and existence
Equiminority and minority

PB 155 867 $2.60

Johns Hopkins U., Baltimore, Md.
ON CERTAIN MONOTONE FUNCTIONS AND PRODUCTS OF INDEPENDENT FUNCTIONS, by Philip Hartman. Technical note no. 21 on Contract AF 18(603)41. Apr 61, 25p. 10 refs. AFOSR-515; AD-254 909.

DESCRIPTORS: *Real variables, *Functions, Series, Sequences.

PB 154 830 $4.60

Manitoba U. (Canada)
THE THEORY OF ORTHOMORPHISMS OF GROUPS, by A. L. Dulmage, Diane M. Johnson, and N. S. Mendelsohn. Technical note on Contract AF 49(638)860. [1960] 42p. 16 refs. AFOSR-230; AD-252 056.

DESCRIPTORS: *Combinatorial analysis, *Statistical analysis

Methods of construction of orthomorphisms, their relation to finite plane geometries, and their transformation properties are given. Orthomorphisms are mappings of a finite group onto itself which produce latin squares orthogonal to the square which is the addition table of the group. The theory is applied to all groups of order up to and including 12 and to the Veblen Weddervurn projective plane of order 9.

PB 154 792 $2.60

North Carolina U., Chapel Hill.
VARIABLE SPACING FINITE DIFFERENCE ANALOGUES. A PRELIMINARY REPORT, by W. Robert Mann and John Gwynn, Jr. Interim rept. no. 2 on Contract DA 36-034-ORD-2896 and Army Ordnance Corps Grant no. DA-ORD-3. Oct 60, 19p. 2 refs. OOR rept. 2775:1-M; AD-247 298.

DESCRIPTORS: *Difference equations, Matrix algebra, Polynomials, Numerical methods and procedures.

Results in the study of finite difference analogues using variable spacing are presented. One aspect of the use of variable spacing in approximations to the laws of exponential growth and decay is considered. This leads to a well-known generalization of the definition of e, and to the conclusion that constant spacing is, in one sense, optimum. Variable spacing in finite difference analogues of the heat equation is then considered. Variable spacing in the x-direction is found to permit a larger time step, in the explicit, 4-point stepping ahead procedure, than is permitted by the stability requirement for constant spacing. The gain seems to be small, and no general directions were found for determining spacing except in a few very special cases. (Author)

PB 155 700 $1.60

Queen Mary Coll., U. of London (Gt. Brit.)
ON SUBSTITUTION OPERATORS. I. A SUMMATION METHOD, by György I. Targonski. Technical (final) rept. on Contract AF 61(052)320. 25 Nov 60, 18p. 5 refs. AFOSR-363; AD-254 366.

DESCRIPTORS: *Operators (Mathematics), Functions, Differential equations, Integral equations.

A special class of operators is investigated. Invariants and eigenfunctions are constructed. Arbitrary functions are expanded in terms of eigenfunctions: this is used as a method to solve functional equations. In this first part of the work, the solution of a particular type of functional equation renders a group of integral representations for function series. (Author)

PB 155 755 $6.30

Rice U., Houston, Tex.
EXISTENCE THEOREMS FOR HARMONIC SUPPORT, by Guy Johnson. Rept. on Contract AF 49(638)632. 21 Jan 61, 33p. 13 refs. AFOSR-179; AD-254 457.

DESCRIPTORS: *Functions, Theory, Potential theory, Functional analysis.

A general definition for harmonic support with respect to a class of functionals is stated. The existence of a harmonic support for a real analytic function along an analytic arc on which the Laplacian is positive is proved. Applications are made to the study of convexity in complex analytic function theory. (Author)

PB 155 703 $5.60

Technion Research and Development Foundation, Ltd. (Israel).
CLASSES OF BIORTHONORMAL SYSTEMS, by Jacob Steinberg. [Annual summary rept. no. 1] on Contract AF 61(052)324. Oct 60, 59p. 14 refs. AFOSR TN-60-1489; AD-254 328.

DESCRIPTORS: Polynomials, *Functions, *Integral equations, Fourier analysis, *Sequences

In the biorthonormality relations $\int p_m(t)\, q_n(t)\, dt = \delta_{mn}$, the sequence $p_n(t)$ is an Appell set of polynomials, and $q_n(t) = (-1)^n q^{(n)}(t)$. Conditions on one sequence are

given for the existence of the other, in two cases for the path of integration, (the real axis and a circle about the origin). A Fourier expansion theory is developed in these two cases by means of summability methods. As a consequence the completeness of a sequence of derivatives in $L_2(-\infty, \infty)$ is demonstrated. The connection with a class of integral equations is also explained. (Author)

PB 155 698 $2.60

Trieste U. (Italy).
INVARIANT MEASURES CONCERNED WITH NAVIER-STOKES EQUATIONS IN TWO VARIABLES, by Giovanni Prodi. Technical note no. 1 on Research Study of Navier-Stokes Equations, Contract AF 61(052)414. 30 Sep 60, 22p. 10 refs. AFOSR-167; AD-254 382.

DESCRIPTORS: *Partial differential equations, Stability, Pressure, Viscosity, Gas flow.

PB 155 289 $3.60

Weizmann Inst. of Science (Israel).
NUMERICAL INTEGRATION OF THE NAVIER-STOKES EQUATION, by J. Gillis. Technical rept. no. 1 on Contract AF 61(052)352. 15 Jan 61, 34p. 3 refs. AFOSR-322; AD-252 942.

DESCRIPTORS: *Partial differential equations, Numerical methods and procedures, Pipes, *Fluid flow, Viscosity, Configuration.

A description is presented on the relaxation solution for the flow of a viscous liquid in the inlet region of a straight circular pipe at high Reynolds number and analytical work on the application of Laguerre functions to the solution of non-linear differential equations over a semi-infinite range. Preliminary work on flow at low Reynolds number and on the Hamel pattern of flow between non-parallel plane walls is also discussed. (Author)

Computing Devices

WAPD-TM-216 $1.25

Bettis Atomic Power Lab., Pittsburgh, Pa.
BAND-1: A DATA REDUCTION PROGRAM FOR THE IBM-704, by B. L. Anderson, A. P. Hemphill, and others. Rept. on Contract AT-11-1-GEN-14. May 61, 53p.

PB 155 701 $1.60

Cambridge Language Research Unit (Gt. Brit.)
SELF-ORGANIZATION AND THE NOTION OF LEVEL. Technical note no. 1, Sep-Oct 60, on Contract AF 61(052)331. [1960] 19p. AFOSR-291; AD-254 297.

DESCRIPTORS: *Data processing systems, Conferences, *Computers, Analysis, Theory.

PB 155 537 $6.60

David Sarnoff Research Center, Princeton, N. J.
RESEARCH ON OPTO-ELECTRONIC COMPUTER COMPONENTS, by H. O. Hook and E. C. Giaimo. Final rept. 1 Jan 59-31 Oct 60, on Contract AF 19(604)4959. 30 Nov 60, 66p. 33 refs. AD-253 543.

DESCRIPTORS: *Digital computers, *Electronic circuits, *Reading machines, Optical images.

Opto-electronic digital circuits using electroluminor and photoconductor components have, with present materials, minimum switching times of approximately 50 milliseconds. Although per-element powers are about 10^{-5} watt the low speed prohibits the practical use of opto-electronic circuits in arithmetic circuits. In input, output and image processing, however, the advantages of parallel processing using neighborhood interaction, threshold logic and negation seem to more than overcome the relative slowness of each cell. Line thinning and thickening, hole fill-in, outlining or fimbriation, motion detection intersection detection, and negation were demonstrated, and de-noising, speck removal, and character simplification seem feasible. Special photoconductor cells may provide an input to a high speed non-scanning character reader. (Author)

PB 156 346 $3.60

Naval [Weapons Lab.] Dahlgren, Va.
THE NAVAL ORDNANCE RESEARCH CALCULATOR (NORC) COMPILER, by Karl Kozarsky. 17 May 55, 35p. 9 refs. NPG rept. no. 1374; AD-62 333.

This report released for sale to the public 28 June 61.

DESCRIPTORS: *Digital computers, *Computers, Mathematical computer data, *Coding.

This report describes the current status of the Naval Ordnance Research Calculator (NORC) Compiler. This routine is an automatic coding technique designed to minimize the time spent on the coding of problems for solution on NORC. The compiler converts unordered symbolic or relative codes to ordered machine (absolute) codes, generates and assembles subroutines from a library file, provides a variety of other services for the coder, and writes the final coding on tape, ready to be run on NORC. Use of the compiler enables a considerable amount of tedious coding time to be saved. The time required to compile a program is usually two minutes or less of NORC machine time. (Author)

MECHANICS

PB 155 340 $2.60

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
IMPULSIVE LOADING OF RIGID-PLASTIC CURVED BEAMS WITH AXIAL CONSTRAINTS, by M. M. Chen, P. T. Hsu, and T. H. H. Pian. Rept. on Contract AF 49(638)160. Dec 60, 27p. 2 refs. ASRL TR 76-5; AFOSR-316; AD-253 292.

DESCRIPTORS: *Beams, *Structures, Loading, Deformation, Mathematical analysis, Buckling, Differential equations, Load distribution, Plasticity.

The problem of the deformation of a rigid-plastic curved beam with axial constraints under given impulsive loading is considered. The governing equations for various phases of motion are formulated. The nonlinear differential equations are then solved by a numerical integration process for different values of loading. The results are compared with the case of a straight beam previously treated by Symonds and Mentel (Impulsive loading of plastic beams with axial constraints, J. Mech. and Phys. Solids, 6:186-202, 1958). (Author)

PB 155 108 $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
ON KORN'S INEQUALITY, by L. E. Payne and H. F. Weinberger (Institute of Tech., U. of Minnesota). Rept. on Contract AF 49(638)228. Jan 61, 21p. 9 refs. Technical note BN-229; AFOSR-275; AD-252 340,

DESCRIPTORS: *Elasticity, Inequalities.

Of fundamental importance in the study of boundary value and eigenvalue problems in classical elasticity is Korn's inequality (Ann. of Math 48:441-471, 1947). In this analysis the best possible Korn constants for the sphere and for the circle are given. (Author)

PB 155 693 $12.00

University Coll., Cork (Eire).
THE λ, μ METHOD FOR RECTANGULAR AND SKEW PLATES, by Patrick M. Quinlan Technical rept. no. 11 on Contract AF 61(514)1163, Dec 60, 169p. 7 refs. AFOSR-450; AD-254 446.

DESCRIPTORS: Sheets, *Metal plates, Shear stresses, *Stresses, Mathematical analysis, *Elasticity, Mechanics, *Mechanical properties, Tensile properties

A new method is presented capable of solving plate problems for rectangular plated under all systems of transverse loadings. Extensive use is made of the two-step functions lambda and mu which change from +1 to -1 at certain points, to enable all cases to be represented by a single formula. The calculus of two-step functions is fully developed leading to easily applied operators for expressing deflections moments, shears, etc. in terms of the functions U sub i and V sub j; i equals 1, 2, 3, 4, and j equals 1, 2. Three worked examples are included. The last section treats problems for a skew plate. The solution is shown to depend on relatively simple functions, called the root functions, and the two-step constants lambda, mu, and lambda sub ij. Expressions are obtained for the particular integral for all the above loadings, and a system of simultaneous equations is obtained for the complementary function required in skew plate problems for all the usual boundary conditions. (Author)

PB 155 692 $3.60

University Coll., Cork (Erie).
NON-LINEAR BENDING OF AN ANNULAR PLATE, by V. G. Hart. Technical note no. 10 on Contract AF 61(514)1163. Dec 60, 37p. 10 refs. AFOSR-449; AD-254 352.

DESCRIPTORS: *Mechanics, Non-linear differential equations, Mathematical analysis, Stresses, Deformation, *Metal plates, Sheets, Rings, Deflection, Digital computers, Boundary layer.

The bending of an annular or ring-shaped plate under the action of edge forces transverse to its initial plane is computed by a method involving the notion of boundary layers, or narrow strips adjacent to the edges of the plate inside which the bending stresses are of primary importance. The plate is considered to be very thin, the width of the ring to be unrestricted, and the problem to have radial symmetry. Non-linear differential equations were integrated numerically by a digital computer in the case of the zero order solution for the boundary layers. In the interior of the plate, the solution was obtained in analytic form in zero order which was combined with the solutions corresponding to each boundary layer to give an approximate solution defined throughout the plate. From this solution the deflection of the plate, the radial bending moment, the slope, and the radial and circumferential membrane stresses were calculated.

PB 155 425 $2.60

Zaragoza U. (Spain).
ACTION PRINCIPLE FOR CLASSICAL MECHANICS, by L. M. Garrido. Rept. on Contract AF 61(052)438. [1960] 23p. 7 refs. AFOSR-302; AD-253 350.

DESCRIPTORS: *Mechanics, *Equations, Motion, Differential equations.

A differential action principle is presented. The principle yields Hamilton's equations of motion and provides a general method to treat perturbations in classical mechanics. (Author)

Aerodynamics and Pneumatics

PB 156 639 $3.60

Dynamic Analysis and Control Lab., Mass. Inst. of Tech., Cambridge.
FLUID POWER CONTROL, by P. F. Meyfarth, F. D. Ezekiel and others. Summary rept. 16 Mar 57-30 Sep 58, on Contract AF 33(616)3173. 2 Oct 58, 37p. 28 refs. WADC Technical rept. no. 58-596; AD-219 895

This report released for sale to the public 29 June 61.

DESCRIPTORS: *Pneumatic servomechanisms, Servomechanisms, Fluid mechanics, Control systems, Servo amplifiers.

Research and development activities of fluid power control have continued along the lines of advancing basic knowledge of fluid power control elements for possible applications to flight control of advanced weapons systems. With the advent of much higher flight speeds encountered in the space age, additional emphasis was placed on high pressure pneumatic systems showing good promise of working at elevated temperatures on very hot gases. Much of the work was concentrated on problems for both hot and cold gas operation. The experimental phases were carried out with cold (room temperature) gases because of difficulties of making fully instrumented hot gas experiments. One of the major problems to be overcome in order to develop effective, fast-response hot gas systems is the problem of converting controlled hot gas energy to mechanical energy in a simple, reliable way without introducing excessive dynamic response time. (Author)

PB 155 281 $5.60

Fluid Dynamics Research Lab., Mass. Inst. of Tech., Cambridge.
ON THE THEORY OF TRANSONIC AILERON BUZZ, by Wiktor Eckhaus. Rept. on Contract AF 49(638)933. Dec 60, 59p. 3 refs. Rept. no. 60-6; AFOSR-229; AD-252 357.

DESCRIPTORS: *Ailerons, *Transonic flow, Theory, Pressure, Damping, Oscillation, Integral equations, Wake, Greens function, Moments.

An analysis is concerned with developing a solution for very low frequencies, which is obtained in the form of a series. In application to the problem of transonic aileron buzz, numerical results for the first approximation of the solution are presented and a stability boundary for the onset of the buzz is obtained. Comparison with available experimental data shows good agreement between theory and experiment. (Author)

PB 155 363 $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
INSTRUMENT TO MEASURE DENSITY PROFILES BEHIND SHOCK WAVES, by W. J. Witteman. Rept. on Contract AF 49(638)401. Feb 61, 26p. 1 ref. Technical note BN-232; AFOSR-364; AD-253 129.

DESCRIPTORS: *Shock waves, Density, Gases, Compressible flow, *Optical analysis, Photographic analysis, Fluid dynamics, Instrumentation, *Optical instruments, Measurement.

An optical method for the quantitative study of the density distribution behind shock waves has been developed. The method which uses a photoelectric recording is based upon the integrated Schlieren method originally devised by Resler and Scheibe. A detailed theoretical analysis is given. Excellent agreement with predicted performance was found in measurements of the density profile behind shock waves in CO_2. The method is very accurate and retains its high sensitivity for weak shocks. The pictures obtained show a nearly exponential approach to equilibrium of the density behind shock waves. (Author)

PB 154 714 $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
INVESTIGATION OF THE FLOW THROUGH AXIAL FLOW COMPRESSOR ROTOR BLADES BY MEANS OF THE ELECTRIC SPARK TECHNIQUE, by John R. Weske and Yoshiro Kageyama. Rept. on Contract AF 49(638)385. Jan 61, 25p. 4 refs. Technican note BN-228; AFOSR-212; AD-252 038.

DESCRIPTORS: *Axial flow compressor blades, Turbines, *Rotor blades, *Subsonic flow, Photographic analysis, Sparks, *Axial flow compressors, *Axial flow turbines, *Spark shadowgraph photography.

Instantaneous flow patterns of subsonic flow past the blades of single stage axial flow compressor rotor were derived from multiple periodic spark traces. Processes of evaluation and of analysis were developed by which the characteristics of performance may be related to the particulars of interaction between the flow and the rotating blading system. Possibilities of extension of the technique of investigation to transonic and supersonic flow and to highly three-dimensional patterns are indicated. (Author)

PB 154 917 $2.60

Institute of Engineering Research, U. of California, Berkeley.
A COMPARISON BETWEEN LANGMUIR PROBE AND MICROWAVE ELECTRON DENSITY MEASUREMENTS IN AN ARC HEATED LOW DENSITY SUPERSONIC WIND TUNNEL, by L. Talbot, J. E. Katz, and C. L. Brundin. Rept. on Contract AF 49(638)502. 27 Jan 61, 27p. 7 refs. Rept. no. HE-150-186; Series no. 132, issue no. 3; AFOSR-336; AD-251 634.

DESCRIPTORS: *Supersonic wind tunnels, *Plasma physics, Electrons, *Interferometers, Density, Measurement, Microwaves, *Plasma jets, Temperature, Gas ionization, *Microwave probes.

Measurements were made of the electron density in a low-density supersonic plasma jet flow by the stagnation point Langmuir Probe method and by a microwave interferometric technique. The two methods yielded results in reasonably good agreement. It was also possible to obtain some information on the radial distribution of ionization in the jet from the microwave measurements. An attempt to determine the electron temperature by measurement of the microwave power radiated from the jet was not successful. (Author)

PB 155 803 $2.60

Polytechnic Inst. of Brooklyn, N. Y.
AXIALLY SYMMETRIC LAMINAR FREE MIXING WITH LARGE SWIRL, by Martin H. Steiger and Martin H. Bloom. Rept. on Contract AF 49(638)445. Jan 61, 30p. 8 refs. PIBAL rept. no. 636; AFOSR-400; AD-254 528.

DESCRIPTORS: Laminar boundary layer, Wake, *Axially symmetric flow, Viscosity, Gas flow, Mixtures, *Turbulence, Integrals, Pressure, *Vortices.

Viscous laminar axially-symmetric free mixing with large swirl is investigated by a boundary layer type of analysis with integral methods. Large swirl generates axial pressure gradients as well as large radial pressure gradients, and therefore alters the streamwise flow. Examples calculated for both incompressible and compressible flow show that the wake may be significantly lengthened by large swirl. However, this effect is shown to be diminished in the compressible case where higher freestream Mach numbers lead to decreased densities, and to decreased centrifugal effects, decreased radial pressure gradients, and decreased axial pressure gradients. In the limiting special case of small or moderate swirl the results agree with those previously obtained by Steiger and Bloom (AD-248 373) in an analysis wherein the induced pressure gradients were neglected a priori. (Author)

PB 156 351 $13.00

Polytechnic Inst. of Brooklyn, N. Y.
DRAG REDUCTION IN LIFTING SYSTEMS BY ADVANTAGEOUS USE OF INTERFERENCE, by Antonio Ferri, Joseph H. Clarke and Anthony Casaccio. Rept. on Contract AF 18(600)694. May 55, declassified 1 Nov 58. 182p. 10 refs. PIBAL rept. no. 272; AD-64 266.

This report released for sale to the public 28 June 61.

DESCRIPTORS: *Wing-body configurations, Lift, Drag, Reduction, Interference, Supersonic flow.

The interference in a number of lifting wing-body configurations is analyzed by use of the linearized theory of supersonic flow. The bodies considered are thin in shape and are oriented perpendicularly to the wing. The bodies represent primarily fuselages or external installations under the wing. Considerable drag reductions at given lift coefficient can be obtained if the body is positioned and contoured so as to contribute to the lift of the wing and to receive thrust from the wing-induced disturbances. The drag rise resulting from the introduction of such a body into a lifting system can therefore be offset by this favorable interference, and that the drag reductions achievable are of the order of the drag of the isolated body for the range of values of the body inclination which are considered. The drag of the wing-body configuration can be less than the wing alone. Reductions in the induced drag of a configuration can result from redistributing - but not changing - the volume of the fuselage in the neighborhood of the wing. This reduction is accomplished by contouring antisymmetrically the fuselage of a midwing aircraft or by changing a low wing aircraft into a high wing aircraft. Fuselage contouring designed according to the generalized transonic area rule for the purpose of attenuating the thickness drag at zero lift is in opposition to the fuselage contouring which produces favorable interference with a lifting wing of zero thickness. (Author)

PB 155 480 $2.60

Polytechnic Inst. of Brooklyn, N. Y.
PRELIMINARY EXPERIMENTAL INVESTIGATION OF THE FLOW ABOUT A BLUNT BODY WITH FLOW-SEPARATION SPIKES AT $M_\infty = 7.9$, by Victor Zakkay. Rept. on Contract AF 49(638)445. Feb 61, 23p. 7 refs. PIBAL rept. no. 631; AFOSR-219; AD-253 200.

DESCRIPTORS: *Aerodynamic configurations, Conical bodies, *Spikes, *Hypersonics, *Heat transfer, Pressure, Distribution, Gas flow, Measurement, Blunt bodies, Separation.

The pressure and heat transfer distribution about a hemispherically-capped cone having a cone half angle of 50 degrees and a bluntness ratio of 0.667, equipped with flow-separation spikes, is presented. The measurements were made at M = 7.9 and a Reynolds number from 0.3 million to 0.5 million. Two different configurations were chosen for this investigation. The over-all reduction of drag and heat transfer with the spike to that without the spike is compared to the recent results obtained for a spiked-nose hemisphere cylinder. For both configurations the results with the spikes indicate a reduction in drag. The heat transfer over the spherical portion of the model was reduced by the addition of the spike; however, heat transfer coefficients as much as three times the stagnation point value were reached at the backward portion of the cone. The heat transfer to the cylindrical portion of the model was increased for both configurations. (Author)

PB 155 869 $3.60

Rensselaer Polytechnic Inst., Troy, N. Y.
EFFECT OF FREE-STREAM VORTICITY ON THE BEHAVIOR OF VISCOUS BOUNDARY LAYER ON BLUNT BODY, by Ting Yi Li. Rept. on Contract AF 18(600)1591. 28 Feb 61, 32p. 16 refs. TR AE 6103; AFOSR-425; AD-254 876.

DESCRIPTORS: Aerodynamic configurations, Gas flow, *Vortices, *Blunt bodies, Friction, *Hypersonic flow, *Boundary layer.

The effect of shock generated vorticity in the oncoming flow upon the skin friction in the stagnation region of an axi-symmetric body traveling at hypersonic speed was investigated under the assumptions of constant density and constant fluid properties. The results indicate that the interaction between the external vorticity and the boundary layer displacement effects produces an induced pressure gradient which must be taken into account in the solution of the problem. The skin friction formula as recently found by Van Dyke is confirmed. (Author)

PB 155 787 $1.60

Rensselaer Polytechnic Inst., Troy, N. Y.
REVIEW OF HYPERSONIC RESEARCH, by Ting Yi. Li. Final rept. 1 Dec 55-31 Dec 60, on Contract AF 18(600)1591. 1 Mar 61, 15p. 22 refs. TR AE 6104; AFOSR-440; AD-254 455.

DESCRIPTORS: *Hypersonic flow, *Gas flow, *Hypersonics, Laminar boundary layer, Blunt bodies, Viscosity, Leading edge flaps, Control surfaces, Mathematical analysis, Fluid flow, Cylindrical bodies, Spheres, Bodies of revolution, Shock tubes.

A summary of the results is presented, obtained during the period of 1955 to 1960, of studies of hypersonic flow problems carried out at the Rensselaer Polytechnic Institute. The problems investigated are: (1) effect of free stream vorticity on laminar boundary layer flow, (2) hypersonic flow field around blunt bodies, (3) real gas effects in hypersonic flows, (4) an inverse problem

in hypersonic viscous flow, (5) some studies of unsteady hypersonic flow phenomena, and (6) hypersonic leading edge problem. Considerable progress has been made in the understanding of these problems. In the study of the real gas effects in hypersonic flows, considerable further work is necessary for a basic understanding of the nonequilibrium flow effects. (Author)

PB 156 327 $2.60

Space Technology Labs., Inc., Los Angeles, Calif.
ON THE AXISYMMETRIC BUCKLING UNDER AXIAL LOAD OF A LONG THIN CYLINDRICAL SHELL CONTAINING AN ELASTIC CORE, by Paul Seide. Rept. on Contract AF 04(647)165. 25 June 58, 26p. Rept. no. EM 8-12; GM-TR-0165-00409; Document no. 9-5333.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Buckling, *Cylindrical bodies, Elasticity, Stresses, Mathematical analysis, Deflection, Load distribution, Stability, Solids, Theory, Elastic shells.

The present report contains a small-deflection analysis of the effect of an elastic core on the buckling strength of a long cylinder under axial compression. It is assumed that the cylinder is so long that any longitudinal transfer of load between the loaded cylinder and the core is negligible; therefore, prior to buckling, longitudinal stress distribution in the cylinder is uniform. Only the axisymmetric buckle mode is investigated; this case can be solved with a minimum of effort and probably yields results entirely adequate for estimating the effect of a given core.

Statics, Kinematics, and Kinetics

PB 171 762 $0.50

Bureau of Naval Weapons, Washington, D. C.
FORCE 0 TO 60,000 LBS. (APPROX.) COMPRESSION ONLY. BuWeps-BuShips Calibration Program. 14 Aug 59, 35p. Secondary Standards Lab. Measurement System Operation Procedure NF-01.

DESCRIPTORS: *Compressometers, Calibration, Instrumentation.

Both the Test Instrument and the force standard (load cell) are placed in the force machine. After preliminary exercising of the instruments, the tare weight in the system is determined. Both the Test Instrument and the standard load cell are hydraulically compressed in the force machine so that the force exerted on the standard is equal to the force on the Test Instrument with proper allowance for the tare weight. The computed load on the standard is compared with the computed load on the Test Instrument at approximately ten calibration points within the range of the Test Instruments. More than one standard may be required to cover the range of the Test Instrument.

PB 171 772 $0.50

Bureau of Naval Weapons, Washington, D. C.
TENSION CALIBRATION KIT. BuWeps-BuShips Calibration Program. 24 Feb 61, 9p. [Secondary Standards Lab.] Fabrication Instructions TDO D-32.

DESCRIPTORS: *Tensiometers, Calibration, Instrumentation

METALLURGY

ANL-6330 $3.50

Argonne National Lab., Ill.
METALLURGY DIVISION. Annual rept. 1960 on Contract W-31-109-eng-38. 274p.

WAPD-238 $1.00

Bettis Atomic Power Lab., Pittsburgh, Pa.
CHEMICAL REPLACEMENT PLATING OF ZIRCALOY, by C. R. Woods and T. R. Padden. Rept. on Contract AT-11-1-GEN-14. May 61, 36p.

AD-256 206 repriced $0.50

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE METALLURGY OF BERYLLIUM, by Webster Hodge. 10 May 61, 6p. 14 refs. DMIC Memo. 105.

DESCRIPTORS: *Beryllium, Metallurgy

AD-255 659 repriced $0.50

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE TECHNOLOGY OF NICKEL-BASE AND COBALT-BASE ALLOYS, by D. A. Roberts. 5 May 61, 6p. 9 refs. DMIC Memo. 104.

DESCRIPTORS: *Nickel alloys, *Cobalt alloys, Mechanical properties. Rupture, Dispersion hardening, Powder metallurgy, Powder alloys, Creep, Tensile properties, Stresses, Alloys

AD-255 456 repriced $0.50

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
STATISTICAL ANALYSIS OF TENSILE PROPERTIES OF HEAT-TREATED Mo-0.5Ti SHEET, by H. R. Ogden and G. H. Beatty. 24 Apr 61, 20p. DMIC Memo. 101.

DESCRIPTORS: *Molybdenum alloys, *Titanium alloys, *Sheets, Tensile properties, Statistical analysis, Heat treatment, Alloys, Refractory materials

PB 171 843 $1.00

Naval Ordnance Test Station, China Lake, Calif.
AN INVESTIGATION OF THE FEASIBILITY OF FORMING ALLOY COATINGS WITH A PLASMA JET, by G. A. Hayes and U. L. Johns. 2 Feb 61, 38p. NAVWEPS rept. 7617; NOTS TP 2616; AD-253 053.

DESCRIPTORS: *Alloys, *Coatings, *Plasma jets, Flame spraying, *Metal coatings, Powders, X-ray diffraction analysis, Chemical analysis, Metallurgical analysis, Density, Hardness, Measurement, Molybdenum alloys, Iron alloys, Titanium alloys, Nickel alloys.

It is feasible to develop metal alloy coatings by spraying mixtures of metal powders with a plasma arc. Several important factors that must be controlled in this process are listed. An inert spraying chamber must be installed in order that coatings can be sprayed at a higher temperature without undergoing excessive oxidation. The powder feed mechanism must be modified so that each kind of powder can be introduced separately into the plasma stream. A high temperature vacuum annealing furnace must be added to increase the density and homogeneity of the coatings and to improve the coating-substrate bond by diffusion.

TID-7603 $1.75

Oak Ridge National Lab., Tenn.
PROCEEDINGS OF THE URANIUM CARBIDE MEETING. Held at Oak Ridge National Laboratory, Oak Ridge, Tennessee, December 1-2, 1960. 166p.

Hydrodynamics, Hydraulics, and Hydrostatics

TID-11514 $1.50

Engineering Research Labs., Columbia U., New York, N. Y.
FLOW PATTERNS OF TWO-PHASE FLOW. A SURVEY OF LITERATURE, by J. H. Vohr. Rept. on Contract AF(30-3)-187 Task IX. 15 Dec 60, 57p.

LA-2535 $1.75

Los Alamos Scientific Lab., N. Mex.
LAGRANGIAN DIFFERENCE APPROXIMATIONS FOR FLUID DYNAMICS, by J. E. Fromm. Rept. on Contract W-7405-eng-36. Mar 61, 67p.

PB 154 791 $12.00

Massachusetts Inst. of Tech., Cambridge.
FULLY DEVELOPED TURBULENT FLOW IN STRAIGHT RECTANGULAR DUCTS: SECONDARY FLOW, ITS CAUSE AND EFFECT ON THE PRIMARY FLOW, by Lawrence C. Hoagland. Doctoral thesis. Technical rept. no. 2 on Contract DA 19-020-ORD-4538. Sep 60, 168p. 28 refs. DSR no. 5-7817; OOR rept. 1935:2-E; AD-247 591.

DESCRIPTORS: *Ducts, *Fluid flow, Velocity, Instrumentation, Pitot tubes, Fluid mechanics, Hydrodynamics, *Turbulent flow.

The problem of fully developed turbulent flow in rectangular ducts is investigated principally by obtaining experimental measurements of the primary and secondary velocity distributions in ducts with aspect ratios of 1:1, 2:1, and 3:1. Mean primary (axial) velocities are measured with both hot wire annemometer and pitot tube instrumentation. Secondary velocities are determined from observations of flow direction using a very sensitive hot wire system. Secondary flows behave in the manner originally suggested by Prandtl. The secondary flows, by convection of axial momentum, have a significant effect on the primary flow distribution, particularly by causing the wall shear stress to be nearly uniform around the duct periphery except for the corner region. An evaluation of the axial momentum terms from the experimental measurements shows the secondary convective terms to be important throughout much of the flow. The behavior near the wall of the transverse turbulence intensity components in the presence of a transverse gradient of wall shear is a major cause of the secondary flow. Expressing these intensity components by a universal relation in the viscous wall region, it is shown that wall shear gradients produce secondary motion driving forces of significant magnitude. (Author)

PB 156 648 $1.60

Navy Underwater Sound Lab., Fort Trumbull, New London, Conn.
SPHERICAL PRESSURE WAVES OF FINITE AMPLITUDE FROM COLLAPSING CAVITIES, by Robert H. Mellen. 17 Sep 56, 13p. 9 refs. USL Research rept. no. 326.

This report released for sale to the public 3 July 61.

DESCRIPTORS: *Cavitation, Pressure, Spheres, Shock waves, Propagation, Mathematical analysis.

Calculations of the pressure wave at large distances from a collapsing spherical cavity have been carried out by a method of characteristics. The shock speed is assumed to be equal to the average of the characteristic speeds at the peak and the base amplitudes of the shock front. Experimental results at a 50-cc distance from the point of collapse show reasonable agreement with the theoretical peak shock amplitude and the time of arrival for cavity radii between 0.5 and 2.5 cm. (Author)

Ferrous Metals

GAMD-1769 $2.00

General Atomic Div., General Dynamics Corp., San Diego, Calif.
THE STABILITY AND PROPERTIES OF ALLOY STEELS AT ELEVATED TEMPERATURES, by M. T. Simnad. A literature survey. Rept. on Contract AT(04-3)-314. 21 Nov 60, 80p.

AD-256 767 repriced $0.75

Naval Research Lab., Washington, D. C.
THE EFFECT OF COLD WORK AND TEMPERATURE ON THE STRENGTH AND STRUCTURE OF STEEL, by P. Shahinian and M. R. Achter. 24 Apr 61, 22p. 15 refs. NRL rept. 5603.

DESCRIPTORS: *Steel, Deformation, Temperature, Mechanical properties, Microstructure.

This investigation was made to determine the influence of cold work on the strength of a low-alloy steel, AISI 4140, at elevated temperature. The measurements, which include hardness, tensile, and creep-rupture properties, have been used to explain the behavior of the material, including an apparent anomaly. In addition, optical and electron microscopy, and x-ray diffraction techniques were employed to follow microstructural changes in the steel. The steel in the quenched and tempered condition was strengthened, in a normal manner, in creep-rupture at high temperatures by large amounts of cold work, but was weakened in an anomalous manner by small amounts of deformation. In contrast to the behavior of the quenched and tempered steel, the steel in the annealed condition was strengthened progressively by an increase in prior cold work.

Nonferrous (except light) Metals

OTS SB-457 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
COBALT (SUPPLEMENT TO CTR-323: COBALT). Apr 61, 13p. 164 refs. OTS Selective Bibliography SB-457.

DESCRITPORS: *Cobalt, *Cobalt alloys, Alloys, Cobalt compounds, Isotopes, *Bibliography.

Lists PB reports, AEC reports and translations on cobalt metal, alloys, compounds, and isotopes added to the OTS collection during the period 1956 to Apr 61. Covers research on the development of cobalt for use in high temperature alloys, superalloys, and intermetallics for high temperature use. Other reports deal with electrodeposition of cobalt, cobalt ferrites, isotopes and other compounds.

OTS SB-458 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
COPPER. Apr 61, 25p. 465 refs. OTS Selective Bibliography SB-458.

DESCRIPTORS: *Copper, *Copper alloys, Alloys, *Bibliography.

Lists PB reports, AEC reports, and translations on copper metals, alloys, wire, and brass and bronze. Covers research on copper-gold alloys, other copper alloys containing such metals as titanium, nickel, cerium, beryllium, indium, tin, and aluminum; general research on low and high temperature properties; copper films, powder metallurgy, and electrolytic copper; semiconducting properties of intermetallic compounds of copper; high temperature insulation of copper wire.

Structural Metallurgy and Corrosion

PB 155 880 $2.60

Cavendish Lab., U. of Cambridge (Gt. Brit.).
FURTHER OBSERVATIONS OF DEFORMATION TWINNING IN ALLOYS AT LOW TEMPERATURES, by P. B. Hirsch, T.E. Mitchell, and P. R. Thornton. Technical note no. 1 on Effect of Strain-Rate on the Flow-Stress of f.c.c. Metals II. Pt. 1. Low Temperature Deformation Twinning, Contract AF 61(052)98. Jan 61, 26p. 10 refs. AFOSR-15; AD-254 922.

DESCRIPTORS: *Low temperature research, *Alloys, Copper alloys, Zinc alloys, *Brass, *Stresses, Low temperature alloys, *Single crystals (Metallurgy), Deformation, Plasticity, Electron microscopy.

Observations on low temperature mechanical twinning in Copper and Copper-Zinc alloys are reported. The absence of indications of twinning in the stress strain curves of crystals of 70:30 alpha brass is discussed in relation to recent preliminary electron microscopy observations. The twinning data are consistent with the existence of a critical twinning stress which decreases with decreasing stacking fault energy. The data are discussed in terms of recent models for twinning in f.c.c. crystals. Difficulties, both in the theory and in the comparison between theory and experimental data, are critically examined. (Author)

PB 151 110 $0.75

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
ENVIRONMENTAL AND METALLURGICAL FACTORS OF STRESS-CORROSION CRACKING IN HIGH-STRENGTH STEELS, by C. J. Slunder and W. K. Boyd. Rept. on Contract AF 33(616)7747. 14 Apr 61, 26p. 25 refs. DMIC rept. 151; AD-254 941.

DESCRIPTORS: Corrosion research, Alloys, *Corrosion, Stresses, Fracture (Mechanics), Metals, *Steel, Microstructure, Theory, Airframes, Aircraft, Guided missiles, Tensile properties, Stainless steel.

In the report, stress-corrosion cracking is defined as the complex interplay of tensile stress and corrosion which leads to cracking in a metal or alloy. The conducive environments are not readily characterized, except that they tend to produce highly localized attack without significant general surface corrosion. Comments are made on the nature of the cracks produced. They tend to grow in a plane perpendicular to the resultant tensile stress. Theories of stress-corrosion cracking are discussed; they do not completely account for the phenomenon. It is generally agreed that an electrochemical step is involved, in which anodic areas are dissolved away. However, because stress-corrosion cracking occurs only in certain environments which are specific to each metal, the phenomenon is not a general characteristic of electrolytes. The philosophy of

laboratory investigation of stress-corrosion cracking is commented upon. Because they are used at high stress, the high-strength steels employed in aircraft and missiles are susceptible to stress-corrosion cracking. (Author)

PB 171 878 $0.75

Illinois U., Urbana.
INELASTIC DESIGN OF LOAD CARRYING MEMBERS. PART III. THE SIGNIFICANCE OF AN INELASTIC ANALYSIS OF ECCENTRICALLY-LOADED MEMBERS, by O. M. Sidebottom. Rept. for Nov 59-Oct 60 on Metallic Materials, Contract AF 33(616)5658. Jan 61, 30p. 14 refs. WADD Technical rept. 60-580, pt. 3.

DESCRIPTORS: Experimental data, *Plasticity, *Elasticity, Deformation, Temperature, Aircraft, Guided missiles, Airframes, Structures, Fatigue (Mechanics)

The author has worked with others on ten investigations, sponsored by Wright Air Development Division, which considered the theoretical and experimental inelastic analyses of eccentrically-loaded tension and compression members. In all cases good agreement was found between theory and experiment for members tested at room temperature and at elevated temperatures. This investigation was undertaken to consider the significance of an inelastic analysis of eccentrically-loaded members. If the inelastic deformation can be considered time independent, a choice has to be made between an elastic an inelastic solution. A study was made of the effect of several variables on the ratio of the load necessary to produce a specified inelastic deformation to the maximum elastic load. If the inelastic deformation is time dependent (creep), the only choice is an inelastic solution. (Author)

PB 155 041 $1.60

Northwestern U., Evanston, Ill.
THE EFFECT OF STRESS ON GRAIN BOUNDARY SLIDING IN CREEP, by N. R. Adsit and J. O. Brittain. Rept. on Contract AF 49(638)780. 2 Feb 61, 17p. 15 refs. AFOSR-282; AD-252 068.

DESCRIPTORS: *Grains (Metallurgy), Crystals, Crystal structure, *Metallic crystals, Zinc, Deformation, Theory, Shear stresses, Creep, Preparation, Test equipment, Temperature, Tests, Metals, Stresses

A number of zinc bicrystal specimens were tested with the boundary loaded in simple shear. Creep tests were run in a vacuum at 200 C and under an argon atmosphere at 350 C. The maximum amount of grain boundary sliding at a given time was proportional to the resolved shear stress on the slip plane. Curves of grain boundary sliding versus time were found to be cyclic but with no regular periodicity. The magnitude of the grain boundary sliding was not proportional to the grain boundary orientation. A model is proposed that involves ledges in the grain boundary and micromigration of these ledges. (Author)

PB 154 982 $2.60

Northwestern U. [Evanston, Ill.]
GRAIN BOUNDARY COHESION AND SOLUTE-DISLOCATION INTERACTIONS DURING STRAIN AGING, by J. O. Brittain. Final rept. for 1 Nov 55-31 Oct 60 on Contract AF 18(600)1598. [1960] 25p. 15 refs. AFOSR-271; AD-251 907.

DESCRIPTORS: *Grain (Metallurgy), Crystals, Crystal structure, *Metallic crystals, Deformation, Internal friction, Chemical impurities, Fracture (Mechanics), Adhesion, Shear stresses, Stresses

The magnitude of the relative displacement of two crystals is dependent upon the matrix slip and in particular, the movement of dislocations into the grain boundary. Obstacles that impede the movement of dislocations into the grain boundary cause a decrease in the magnitude of the grain boundary shear. A theory was developed for the 250°C internal friction peaks observed in cold worked and martensitic steels. This phenomena was described as a process involving the growth and solution of a carbide precipitate as a consequence of an oscillating dislocation.

IDO-14506 $1.25

Phillips Petroleum Co., Idaho Falls.
CORROSION OF ALLOYS IN VARIOUS ICPP DECONTAMINATION SOLUTIONS, by T. L. Hoffman and G. S. Adams. Rept. on Contract AT(10-1)-205. 14 Apr 61, 60p.

PB 171 547 $0.50

Rock Island Arsenal Lab., Ill.
HUMIDITY AND TEMPERATURE EFFECTS ON ATMOSPHERIC CORROSION RATES. LITERATURE REPORT, by R. LeMar. 21 Feb 61, 17p. 34 refs. Rept. no. 61-675; AD-256 597.

DESCRIPTORS: *Steel, Corrosion, Humidity, Temperature, *Corrosion research, Atmosphere.

There is some disagreement among conclusions of various studies that have been made on the atmospheric corrosion of steel. Laboratory tests generally indicate that a steel surface forms a highly protective, invisible oxide film which is stable at ambient temperatures and high relative humidity levels. However, when this oxide film is thick enough to be visible or when isolated rust pits are present, such oxides can stimulate further corrosion through several possible mechanisms at relative humidities above 50%. In comparison to these results, practical warehouse storage tests have indicated rust to appear on bare steel at ambient temperatures with relative humidities as low as 30%. Similar differences in results appear in regard to dew effects on corrosion rates. Discrepancies are probably frequently due to variation between studies of factors such as the nature and amount of atmospheric and/or metal surface contamination present during the studies. Temperature effects on corrosion rates have not been entirely clarified. From the standpoint of controlled warehouse storage, it seems feasible to add adsorp-

tion beds and filters to the humidity control units to remove contaminant gases and particles, thus eliminating these factors from the warehouse. Then, dependent upon the metal surface cleanliness, relative humidities of at least 60% should be permissible.

PB 171 879 $1.25

Southampton U. (Gt. Brit.)
CRITERIA FOR COMPARING THE EFFECTIVENESS OF DAMPING TREATMENTS, by D. J. Mead. Rept. on Metallic Materials, Contract AF 61(052)332. Jan 61, 45p. 6 refs. WADD Technical rept. 61-25.

DESCRIPTORS: *Damping, Sound transmission, Vibration, Stresses, *Metal plates, Structures, Mathematical analysis, *Fatigue (Mechanics)

Criteria have been deduced indicating the effectiveness of a damping treatment in attenuating bending stresses, accelerations, inertia forces and sound pressure transmitted associated with simple vibrating plates under harmonic and random excitation. Coincidence sound transmission through plates is also considered. The importance is emphasized of including in these criteria the factors by which the damping treatment increases the mass and stiffness of the system. Three different commercial treatments have been compared using some of the criteria and it has been shown that the treatment providing the highest loss factor increment to the system is not necessarily the most effective in reducing all the response quantities. (Author)

GEAP-3548 $0.50

Vallecitos Atomic Lab., General Electric Co., Pleasanton, Calif.
CORROSION BEHAVIOR OF SOME METAL BORIDES, by E. W. Hoyt, J. Chorne, and W. V. Cummings. Technical rept. on Contract AT(04-3)-189. 18 Oct 60, 18p.

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

NAS-NS-3032 $0.50

Alcoa Research Labs., New Kensington, Pa.
THE RADIOCHEMISTRY OF ALUMINUM AND GALLIUM, by J. E. Lewis. Apr 61, 52p.

PB 154 909 $2.60

Armour Research Foundation, Chicago, Ill.
THE NATURE OF THE PRIMARY PROCESSES IN ELECTRON AND GAMMA IRRADIATED SYSTEMS, by P. Y. Feng. Rept. on Contract AF 18(603)121. 21 Feb 61, 26p. 16 refs. AFOSR-241; AD-251 616.

DESCRIPTORS: Reaction kinetics, Energy, *Radiochemistry, *Electrons, *Gamma rays.

A study was conducted on the distribution of the primary events in electron irradiated systems as a function of electron energy. It is shown that, for systems of radiation chemical interest (i.e. with radiation energies in the Kev to Mev region) approximately one-half of the absorbed energy is dissipated via secondary electrons with average energies less than approximately 60 ev and that variations in the effective spectrum of the electrons occur only in the higher energy region. Since the relative cross sections for the various electronic transitional events are much less sensitively energy dependent with high energy electrons, the results of this model explains satisfactorily the known insensitivity of many primary radiation chemical processes on the initial radiation energy spectrum. (Author)

NAA-SR-4542 $1.00

Atomics International, Canoga Park, Calif.
INVESTIGATIONS OF NEUTRON PENETRATION IN TiH AND STEEL SLABS, by R. H. Karcher. Rept. on Contract AT(11-1)-GEN-8. 15 May 61, 38p.

NAA-SR-5904 $0.50

Atomics International, Canoga Park, Calif.
REACTIVITY WORTH OF SODIUM IN SODIUM COOLED REACTORS, by R. W. Keaten. Rept. on Contract AT(11-1)-GEN-8. 1 June 61, 14p.

BNL-631 $0.50

Brookhaven National Lab., Upton, N. Y.
PROGRAMS FOR IBM 610 COMPUTER TO PERFORM KURIE ANALYSIS OF BETA SPECTRA, by B. D. Pate and D. J. Silvester. Sep 60, 15p.

NAS-NS-3035 $0.75

Brookhaven National Lab., Upton, N. Y.
THE RADIOCHEMISTRY OF CESIUM, by H. L. Finston and M. T. Kinsley. Feb 61, 73p.

PB 156 649 $8.10

Convair, Fort Worth, Tex.
MONTE CARLO CALCULATIONS OF FAST-NEUTRON SCATTERING IN AIR, by M. B. Wells. Rept. on Contract AF 33(600)38946. 13 May 60, 84p. 22 refs. NARF-60-8T; FZK-9-147, Vol. I; AD-237 889.

This report released for sale to the public 30 June 61.

DESCRIPTORS: *Fast neutrons, *Scattering, Air, Inelastic scattering, *Numerical methods and procedures, *Neutron scattering.

The results of a Monte Carlo calculation of the scattering of fast neutrons in an infinite homogeneous medium of air are presented. The results of these calculations, which include the effect of inelastic scattering, are presented in terms of angular distributions, energy spectra, and tissue dose rates at source-detector separation distances of from 10 to 100 ft. A parameter

study was completed for source energies of 0.33, 1.1, 2.7, 4, 6, 8, 10.9, and 14 Mev and source angles with respect to the source-detector axis from 5° to 180°. A description is given of the Monte Carlo problem and the mathematical procedures used in the calculations. Graphs are also given that show the distribution of the scattered flux and dose rate as a function of source energy, source angle, and source-detector separation distance. Tables are presented giving the energy distribution of the air-scattered flux. (Author)

AD-255 755 repriced $0.50

Engineering Test Div., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
DESCRIPTION AND OPERATION OF A UNIVERSAL ADAPTOR FOR GENERAL MILLS AND MODEL 8 MANIPULATORS, by Vincent L. J. Di Rito. Rept. for Nov 59-Dec 60 on Experimental and Technical Support for the Design, Construction and Operation of the Air Force NETF. Dec 60, 19p. WADD Technical note 60-305.

DESCRIPTORS: Adapters, Test equipment, *Test facilities, *Remote control systems, Contamination, *Laboratory equipment, *Tools, *Machine tools, Handling, Radiation hazards, *Nuclear physics laboratories, Design, Operation, Instrumentation.

The universal adaptor provides a simple and inexpensive means for converting standard commercial power tools for remote operation in a hot cell. Power tools equipped with these adaptors can be attached and held firmly by either the General Mills or the modified Model 8 manipulator. The method of attaching the tool to the arm of the manipulator is rapid so that operation is speeded up and the work accomplished is increased. Operators find the tools easy to control and change from one manipulator to the other. The modifications to the Model 8 manipulator to accommodate the adaptor do not interfere with the normal operation of the hand, but extend the capability of the device beyond that of the original design. (Author)

PB 155 619 $17.00

Federal Civil Defense Administration, Battle Creek, Mich.
BLAST EFFECTS OF ATOMIC WEAPONS UPON CURTAIN WALLS AND PARTITIONS OF MASONRY AND OTHER MATERIALS, by Benjamin C. Taylor. Rept. for Mar-June 58 on Operation Upshot-Knothole. Aug 56, 268p. (refs. omitted) WT-741.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Structures, Materials, Tests, *Nuclear weapons, *Blast

Blast-resistance tests were made during Shot 9 on various types of wall panels and interior partitions. Buildings 3.29a, b, c, and d were rectangular test cells, open at the front and rear, having reinforced-concrete floor slabs, roof slabs, and dividing walls. Windowless test wall panels were built into the cell openings of Building 3.29a and 3.29c for the full height and width. The cells of Buildings 3.29b and 3.29d contained interior test partitions of many types and were enclosed with windowed masonry with in front and solid masonry walls at the rear. Two ranges were selected for each of the building types, one at about 4.5-psi peak side-on overpressure and the other at about 7.5-psi peak side-on overpressure, in order to bracket the collapse overpressure levels for the standard construction of the test panels and partitions. Numerical integration was used for computation of wall response. Adjustments were made to the unknown variables to correlate the theoretical and observed results. Motion picture records were obtained at a rate of 64 frames per second, and selected frame sequences are included. The heavy dust conditions made many of the pictures unusable. Estimated maximum overpressure levels are listed for collapse of panels constructed of the various materials as determined from these tests.

PB 155 423 $8.60

Free U., Berlin (West Germany).
DISSOCIATION CROSS SECTION, by Siegfried Grobmann. Rept. on Contract AF 61(052)217. Nov 60, 100p. 43 refs. AFOSR-224; AD-251 236.

DESCRIPTORS: *Inelastic scattering, Hydrogen, Atoms, Molecules, Analysis, Quantum mechanics, Dissociation.

An investigation was conducted on the inelastic scattering between hydrogen molecules and hydrogen atoms. This special problem was selected because it is the only example of practical importance where calculations of the interaction potential are existing. (Author)

NYO-9374 $2.00

Johns Hopkins U., Baltimore, Md.
STRUCTURAL ANALYSIS AND DESIGN CONSIDERATIONS FOR SHIPPING CONTAINERS OF HIGHLY RADIOACTIVE MATERIALS, by R. G. Sanford. Rept. on Contract AT(30-1)-1477. May 61, 78p.

PB 155 426 $1.10

Laboratorie de Physique Theorique et Hautes Energies [Faculte des Sciences] Orsay (France).
ON THE EFFECTIVE INTERACTION IN FINITE NUCLEI, by Bernard Brémond. Technical note no. 22 on Contract AF 61(052)173. July 60, 10p. 7 refs. AFOSR-385; AD-253 280.

DESCRIPTORS: *Quantum mechanics, Quantum statistics, Atomic orbitals, Nuclear shell models, *Nuclei, Nuclear energy levels, Nuclear binding energy.

The expectation values of the two-nucleon interaction are calculated using Brueckner's matrix and shell model wave functions. These values are compared with phenomenological ones. The discrepancies can be explained by the effected approximations. (Author)

UCRL-9603 $3.50

Lawrence Radiation Lab., U. of California, Berkeley.
THE CHEMICAL INTERACTION OF ACCELERATED CARBON-14 IONS WITH BENZENE, by R.T. Mullen. Rept. on Contract W-7405-eng-48. 14 Mar 61, 263p.

NAS-NS-3034 $0.50

Michigan U., Ann Arbor.
THE RADIOCHEMISTRY OF TITANIUM, by C. K. Kim. Mar 61, 27p.

NAS-NS-3036 $0.50

Oak Ridge National Lab., Tenn.
THE RADIOCHEMISTRY OF GOLD, by J. F. Emery and G. W. Leddicotte. May 61, 38p.

ORNL-3127 $2.75

Oak Ridge National Lab., Tenn.
REACTOR CHEMISTRY DIVISION. Annual progress rept. for period ending 31 Jan 61 on Contract W-7405-eng-26. 185p.

PB 156 638 $5.60

Pavia U. (Italy).
A METHOD FOR THE MEASUREMENT OF THE NUCLEAR TRANSVERSAL RELAXATION, by G. Bonera, L. Chiodi and others. Final technical rept. for Feb 58-Jan 59 on Contract DA 91-508-EUC-278. Feb 59, 52p. 18 refs. AD-212 714.

This report released for sale to the public 3 July 61.

DESCRIPTORS: Liquids, *Nuclear magnetic resonance, Magnetic fields, Relaxation oscillators, Diffusion, Nuclear magnetic moments, *Nuclear reactions.

A new method is described for measuring transverse relaxation times in liquids. The method is based on the observation of the decay of the nuclear magnetization when it precesses in a plane perpendicular to the constant magnetic field. This last condition is realized by stopping the variation of the constant magnetic field during a fast adiabatic passage at a proper time. The constant magnetic field is modulated with a saw-tooth current from a relaxation oscillator and an amplifier. When the voltage induced by the nuclear precession reaches a fixed value the relaxation oscillator is stopped with a delay such that the constant field stops its variation at the value for which the signal has the largest amplitude. Measurements were made on some liquids and the preliminary results indicate that the values of T_2 (transverse relaxation time) are very close to those of T_1 (longitudinal relaxation time). (Author)

NAS-NS-3033 $0.50

Phillips Petroleum Co., Idaho Falls.
THE RADIOCHEMISTRY OF ANTIMONY, by W. J. Maeck. Feb 61, 59p.

DP-577 $0.50

Savannah River Lab., Aiken, S. C.
RADIOLYTIC AND CHEMICAL STABILITY OF PURE HYDROCARBONS, by B. P. Dennis. Rept. on Contract AT(07-2)-1. Apr 61, 12p.

PB 155 421 $2.60

Weizmann Inst. of Science (Israel).
ELECTRIC MONOPOLE TRANSITIONS IN COLLECTIVE NUCLEI, by A. S. Reiner. Technical note no. 8 on Contract AF 61(052)337. 1 Nov 60, 30p. 65 refs. AFOSR-171; AD-253 343.

DESCRIPTORS: *Electron transitions, Nuclei, Phonons, *Nuclear states, Nuclear physics, Quantum statistics, Excitation, Radioactive decay, Probability, Nuclear binding energy.

Electric monopole transitions are studied in nuclei with phonon and rotation-vibration spectra. Reduced transition probabilities are derived in a model which assumes incompressibility of nuclear matter and are compared with rates of competing E2 Gamma transitions. In the latter are for the strong-coupling model included appreciable effects due to rotation-vibration interaction. The derived branching ratios turn out to be essentially independent of nuclear parameters. In spite of a remarkable consistency of the model, as shown for instance in various calculations of the zero-point fluctuation amplitude of the Beta vibrations, serious discrepancies in branching ratios are observed. Those are tentatively ascribed to the assumption of incompressibility of nuclear matter in the surface layer. (Author)

Elementary Particles

PB 154 931 $1.60

Maryland U., College Park.
CUSP PHENOMENA IN THE REGION OF TWO NEIGHBORING THRESHOLDS, by J. Sucher, G. A. Snow, and T. B. Day. Rept. on Contract AF 49(638)24. 12 Jan 60, 16p. 7 refs. Dept. of Physics Technical rept. no. 205; AFOSR-174, AD-252 054.

DESCRIPTORS: *Hyperons, *Nuclear reactions, Parity, Differential cross section, *Particles.

Previous discussions of the cusp phenomena at the threshold for a new reaction are extended to the case of two neighboring thresholds. The S-matrix is constructed from an n x n K-matrix in such a way as to insure that the physical S-matrix is unitary when only r of the n channels are open. (Author)

MURA-477 $0.50

Midwestern U. Research Association, Madison, Wis.
COMPUTER STUDIES OF BEAM STACKING EFFECTS, by D. Reilly. Rept. on Contract AT(11-1)-384. 30 June 59, 7p.

PB 154 180 $1.60

El-Tronics, Inc., Philadelphia, Pa.
THE RADIACMETER AN/PDR-36(XE-1). DEVELOPMENT OF THREE ENGINEERING MODELS, by Seymour B. Horowitz. Quarterly progress rept. no. 3, 1 Sep-30 Nov 52, on Contract DA 36-039-sc-15546. [1952] 17p. AD-9182.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Ionization chambers, *Radiation counters, Design, Calibration.

The limit of miniaturizing the AN/PDR-36(XE-1) has been faced for these models. It does not seem likely that any more reduction in size will be made without a reduction in the range of the unit. The weight will fall within limits and is estimated to be 1.3 lbs. The watertight problem is now reduced to finding the proper type of gasket material for the lids. The plastic case has a limited strength for compressing a gasket and together with the thin walls, which will not allow much surface area, for making the seal.

PB 156 647 $2.60

Naval Radiological Defense Lab., San Francisco, Calif.
A SERVO-TYPE INTERMITTENT DIGITAL READOUT FOR PORTABLE INSTRUMENTS, by D. Y. Lee. 30 Aug 60, 24p. 4 refs. Research and development technical rept. USNRDL-TR-459; AD-244 938.

This report released for sale to the public 30 June 61.

DESCRITPROS: *Reading machines, Digital systems, Design, Specifications, Circuits, Servomechanisms, *Radiation instruments.

The intermittent digital readout offers a significant improvement over the scale changing meter. Interpolation and averaging are eliminated by static digital display, and scale factors are eliminated by a three decade linear scale. A developmental model of the intermittent digital readout was constructed and tested. Dead-band is ± 1.05% of full scale and accuracy is +9% to -10% at any point from essentially zero to full scale. Input for full scale is +0.7 dc. The dimensions of the readout are 3 1/2 X 1 1/2 X 4 1/2 in. and the weight is 20 oz. Although performance of the model is satisfactory, it is apparent that circuit refinement and improved motor design are desirable. Other approaches were investigated and rejected because of cost and complexity. This work demonstrated the feasibility of the servo digital readout approach as an improvement over the meter display in portable instrument designs. A compromise between performance and cost will be required in the selection of a digital readout system to meet specific instrument requirements. (Author)

PB 156 645 $4.60

Naval Radiological Defense Lab., San Francisco, Calif.
A TECHNIQUE FOR UNFOLDING GAMMA-RAY SCINTILLATION SPECTROMETER PULSE-HEIGHT DISTRIBUTIONS, by N. E. Scofield. 24 June 60, 49p. 20 refs. Research and development technical rept. USNRDL-TR-447; AD-244 690.

This report released for sale to the public 30 June 61.

DESCRIPTORS: *Gamma ray spectra, Detection, Measurement, Gamma ray spectrometers, *Scintillation counters, Pulse height analyzers, Distribution, Calibration, Matrix algebra, Tables.

An iteration method for unfolding scintillation spectrometer pulse-height distributions was programmed for digital computer. This method utilizes an experimentally determined scintillation-detector response matrix, the formation of which is described. The method of correction at each iteration is designed to prevent the appearance of negative values for the photon number flux in source-energy bins of the unfolded spectrum. A simple graduating formula is used to smooth oscillations which appear after many iterations. (Author)

TID-4901 $0.50

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
CLOUD CHAMBERS. A list of selected references to technical reports, books and journals, comp. by H. D. Raleigh. 3 Apr 61, 7p.

PB 154 187 $8.60

Polaroid Corp., Cambridge, Mass.
DEVELOPMENT OF PHOTODOSIMETERS OF THE "DRY DEVELOPMENT" TYPE, by Dwight P. Merrill. Final rept. 1 Apr 51-1 Dec 52, on Contract DA 36-039-sc-146. Dec 52, 92p. 2 refs. AD-3080.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Dosimeters, *Photographic equipment, Gamma radiation, Exposure, Detection, *Photographic film, *Radiation instruments, Production, *Radiation counters.

Efforts were devoted to improving the previously developed radiac detecting element and photographic film holder. Tests were made of a variety of negatives and processing solutions. Those selected provided 0.5- to 50-r and 20- to 600-r ranges which were reproducible within a given lot of components; difficulty occurred, however, in maintaining the required range from lot to lot. The variability of the negative between lots was particularly troublesome. Reliability of the γ-ray calibration was tested at high and low ambient temperatures and humidities. In comparison with

material processed by conventional (wet process) means, the dry-development type radiac detectors displayed to anomalies. Heat exposure alone, giving an apparent dose without γ-ray exposure, was used to determine the most advantageous RH for assembly of the detectors. Excessive dryness destroyed the desired uniformity of the image by producing negative wrinkle and curl. Heat together with γ-ray dosage, in general, increased the apparent sensitivity of the detector. Accuracy was impaired if more than 24 hours elapsed between irradiation and processing of the radiac detectors. The processing of the detector in the film holder was found to be critical to alignment of the spreading surfaces, forces between these, and to the manner of attachment of the spreader spring.

Nuclear Engineering and Power

AGN-8015 $1.75

Aerojet-General Nucleonics, San Ramon, Calif.
SULFUR-COOLED POWER REACTOR STUDY, by D. R. Sawle. Final rept. on Contract AT(04-3)251. Dec 60, 68p.

ANL-6374 $1.50

Argonne National Lab., Ill.
REACTOR DEVELOPMENT PROGRAM. Progress rept. May 61, on Contract W-31-109-eng-38. 15 June 61, 63p.

ANL-6078 $2.25

Argonne National Lab., Ill.
ZERO-POWER EXPERIMENTS ON THE ARGONNE LOW POWER REACTOR (ALPR), by D. H. Shaftman. Rept. on Contract W-31-109-eng-38. May 61, 103p.

NAA-SR-4989 $1.00

Atomics International, Canoga Park, Calif.
ANALYSIS OF FUELED IRRADIATION CAPSULES WHICH FAILED IN THE MATERIALS TESTING REACTOR, by D. G. Harrington. Rept. on Contract AT(11-1)-GEN-8. 15 June 61, 47p.

DP-605 $1.50

du Pont de Nemours, E. I. and Co., Wilmington, Del.
HEAVY WATER MODERATED POWER REACTORS, comp. by R. R. Hood and L. Isakoff. Progress rept. Mar 61 on Contract AT(07-2)-1. May 61, 65p.

TID-5762 (Vol. I, Suppl. I) $2.00

Federal Power Commission. Bureau of Power, San Francisco, Calif.
NEW PRODUCTION REACTOR POWER PLANT ECONOMIC FEASIBILITY STUDY. Supplemental rept. Feb 61, 105p.

GA-1378 $3.00

General Atomic Div., General Dynamics Corp., San Diego, Calif.
40-MW(E) PROTOTYPE HIGH-TEMPERATURE GAS-COOLED REACTOR RESEARCH AND DEVELOPMENT PROGRAM. Quarterly progress rept. for period ending 31 Mar 60 on Contract AT(04-3)-314. Apr 61, 200p.

GA-1640 $3.00

General Atomic Div., General Dynamics Corp., San Diego, Calif.
40-MW(E) PROTOTYPE HIGH-TEMPERATURE GAS-COOLED REACTOR RESEARCH AND DEVELOPMENT PROGRAM. Quarterly progress rept. for period ending 30 June 60 on Contract AT(04-3)-314. Apr 61, 217p.

GA-1774 $3.50

General Atomic Div., General Dynamics Corp., San Diego, Calif.
40-MW(E) PROTOTYPE HIGH-TEMPERATURE GAS-COOLED REACTOR RESEARCH AND DEVELOPMENT PROGRAM. Quarterly progress rept. for period ending 30 Sep 60 on Contract AT(04-3)-314. Apr 61, 254p.

GA-2065 $0.50

General Atomic Div., General Dynamics Corp., San Diego, Calif.
MARITIME GAS-COOLED REACTOR PROGRAM. STABILITY OF BeO-UO_2 REACTOR FUEL MATERIAL DURING IRRADIATION, by D. E. Johnson. Rept. on Contract AT(04-3)-187. 31 Mar 61, 26p.

HW-61236 (Suppl 3) $0.50

Hanford Atomic Products Operation, Richland, Wash.
PLUTONIUM RECYCLE TEST REACTOR FINAL SAFEGUARDS ANALYSIS. SUPPLEMENT 3. EFFLUENT ACTIVITY LIMITS, by N. G. Wittenbrock. Rept. on Contract AT(45-1)-1350. Apr 61, 13p.

UCRL-6220 $2.50

Lawrence Radiation Lab., U. of California, Livermore.
HAZARDS SUMMARY REPORT FOR THE LRL CRITICAL FACILITY, by J. Carothers. Rept. on Contract W-7405-eng-48. 3 Mar 60, 142p.

MND-M-1814 $5.00

Martin Co., Baltimore, Md.
PM-1 NUCLEAR POWER PLANT PROGRAM, by E. H. Smith and J. S. Sieg. Quarterly progress rept. no. 3, 1 Sep-30 Nov 59, on Contract AT(30-1)-2345. Mar 60, 356p.

NDA-2131-16 $1.50

Nuclear Development Corp. of America, White Plains, N. Y.
COMPILATION OF EXPERIMENTAL FORCED-CONVECTION, QUALITY BURNOUT DATA WITH CALCULATED REYNOLDS NUMBERS, by H. Firstenberg, K. Goldmann and others. Rept. on Contract AT(30-1)-2303(IX). 30 June 60, 59p.

TID-7597(Vols. I & II) $8.50 Set

Oak Ridge National Lab., Tenn.
COMPATIBILITY PROBLEMS OF GAS-COOLED REACTORS. Proceedings of US/UK Meeting, Oak Ridge National Laboratory, 24-26 Feb 60. 3 Mar 61, 881p.

ORNL-3102 $4.00

Oak Ridge National Lab., Tenn.
GAS-COOLED REACTOR PROJECT. Quarterly progress rept. for period ending 31 Mar 61 on Contract W-7405-eng-26. 279p.

ORNL-3104 $2.75

Oak Ridge National Lab., Tenn.
THERMONUCLEAR DIVISION. Semiannual progress rept. for period ending 31 Jan 61 on Contract W-7405-eng-26. 153p.

TID-7604 $3.00

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
SHAFT SEALS FOR COMPRESSORS AND TURBINES FOR GAS-COOLED REACTOR APPLICATION. Proceedings of Meeting at Oak Ridge National Laboratory, Oak Ridge, Tennessee, Dec 16-17, 1959, 240p.

IDO-16665 $1.75

Phillips Petroleum Co., Idaho Falls.
MTR - ETR TECHNICAL BRANCHES. Quarterly rept. 1 Oct-31 Dec 60 on Contract AT(10-1)-205. 4 Apr 61, 71p.

IDO-16640 $0.75

Phillips Petroleum Co., Idaho Falls.
SPERT PROJECT, ed. by F. Schroeder. Quarterly technical rept. Apr-June 60 on Contract AT(10-1)-205. 7 Apr 61, 37p.

IDO-14521 $2.75

Phillips Petroleum Co., Idaho Falls.
A STUDY OF THE FEASIBILITY OF A SMALL SCALE REPROCESSING PLANT FOR THE DRESDEN NUCLEAR POWER STATION, by H. Schneider, R. D. Fletcher and others. Rept. on Contract AT(10-1)-205. 28 Apr 61, 195p.

SCDR-337-60 $0.50

Sandia Corp., Albuquerque, N. Mex.
FABRICATION OF WELDED VESSEL FOR THE SANDIA ENGINEERING REACTOR, by V. G. Nelson. Development rept. Mar 61, 17p.

SL-1868 $3.00

Sargent and Lundy, Chicago, Ill.
REACTOR CONTAINMENT DESIGN STUDY, by R. A. Johnson and I. Nelson. Atomic Energy Commission Research and Development rept. on Contract AT(11-1)-938. 18 May 61, 213p.

DP-532 $2.75

Savannah River Lab., Aiken, S. C.
HANDBOOK OF NUCLEAR SAFETY, by H. K. Clark. Rept. on Contract AT(07-2)-1. Jan 61, 523p.

K-1479 $0.50

Union Carbide Nuclear Co., Oak Ridge, Tenn.
POROUS METAL FILTERS; APPLICATION TO FEED MATERIALS PRODUCTION, by T. Shapiro and E. L. Halstead. Rept. on Contract W-7405-eng-26. 15 June 61, 25p.

WCAP-1432 $1.75

Westinghouse Electric Corp., Pittsburgh, Pa.
MULTI-REGION REACTOR LATTICE STUDIES, by I. H. Coen. Quarterly progress rept. 1 Jan-31 Mar 61, on Contract AT(30-1)-2176. Apr 61, 73p.

Nuclear Reactions

BNL-672 $0.50

Brookhaven National Lab., Upton, N. Y.
NEUTRON CROSS SECTION EVALUATION GROUP, by R. Sher and S. Moore. Newsletter no. 4. May 61, 9p.

BNL-666 $0.50

Brookhaven National Lab., Upton, N. Y.
NEUTRON CROSS SECTION EVALUATION GROUP. NEUTRON CROSS SECTIONS IN ZIRCONIUM, APRIL 1961, by R. Sher. May 61, 13p.

UCRL-9589 $2.00

Lawrence Radiation Lab., U. of California, Berkeley.
CHARGE-EXCHANGE PRODUCTION OF ANTI-NEUTRONS AND THEIR ANNIHILATION IN HYDROGEN, by C. I. Hinrichs. Rept. on Contract W-7405-eng-48. 14 Mar 61, 83p.

UCRL-9610 $1.00

Lawrence Radiation Lab., U. of California, Berkeley.
THE ELASTIC SCATTERING OF 24-Mev DEUTERONS, by D. G. Hoffman. Sep 60, 41p.

UCRL-9595 $2.25

Lawrence Radiation Lab., U. of California, Berkeley
INVESTIGATION OF NUCLEAR REACTIONS BY RECOIL STUDIES OF RADIOACTIVE PRODUCTS, by J. R. Morton III. Rept. on Contract W-7405-eng-48. Apr 61, 111p.

UCRL-9597 $2.50

Lawrence Radiation Lab., U. of California, Berkeley
A STUDY OF K MESONS IN ANTIPROTON-PROTON ANNIHILATION, by G. R. Kalbfleisch. Rept. on Contract W-7405-eng-48. 7 Mar 61, 123p.

PB 161 582 $0.75

National Bureau of Standards, Washington, D. C.
AN EVALUATION OF KACSER'S SECOND ORDER BORN APPROXIMATION TO THE BREMSSTRAHLUNG DIFFERENTIAL CROSS SECTION, by George S. Ofelt June 61, 22p. 3 refs. Technical note no. 81.

DESCRIPTORS: *Bremsstrahlung, *Differential cross section, Numerical analysis.

The second order term, as derived by C. Kacser [Proc Roy. Soc. A253 (1959)], of the Born approximation series for the bremsstrahlung cross section differentia with respect to photon energy, photon direction, and final electron direction averaged over initial and summed over final polarization states has been put in a form that admits to numerical evaluation for the coplanar case. The results are valid for relativistic as well as non-relativistic incident electrons. Completely general (non-coplanar) expressions are included for the first order (Bethe-Heitler) and second order terms. However, the latter has not been given in a form admissible to numerical evaluation. Tabulated values are given for the case of the incident electron kinetic energy = 500 kev, photon energy = 450 kev, and photon direction 20^{o} from the incident electron direction. For this case the second order term increases the differential cross section by about 50 percent for Al and about 200 percent for Au for the various angles of electron emission. A rough approximation to the integrated (over final electron direction) cross section is included and a comparison is made with experimental values. The inclusion of the second order term brings the theoretical cross section closer to the experimental values.

ORNL-3113 $2.75

Oak Ridge National Lab., Tenn.
ATOMIC AND MOLECULAR COLLISION CROSS SECTIONS OF INTEREST IN CONTROLLED THERMONUCLEAR RESEARCH, by C. F. Barnett, W. B. Gauster, and J. A. Ray. Rept. on Contract W-7405-eng-26. 161p.

PB 171 849 $1.25

Plesset, E. H., Associates, Inc., Los Angeles, Calif.
ATOMIC SCATTERING PROCESSES, by Edward Gerjuoy. Scientific rept. no. 3 on Contract AF 19(604)6187. 30 Jan 61, 45p. 79 refs. C25-61(U)59; TR-106; AFCRL-69; AD-254 860.

DESCRIPTORS: *Electrons, *Scattering, Hydrogen, *Atoms, *Particles, Nuclear reactions.

Gains in understanding of atomic collision processes during the past three years or so are reviewed. Recent theoretical and experimental developments in the elastic scattering of electrons by atomic hydrogen are discussed, as well as theoretical and experimental developments in the collisions of heavy particles, i.e., atom-atom and ion-atom collisions. It is emphasized that there exist successful calculations for just about every type of collision process, but that on the other hand the data in every type of process include apparent deviations from theoretical prediction. This apparent contradiction arises from the fact that in no actual collision problem are the theoretical equations solvable without approximation. In fact, atomic collision problems are mathematically so complicated that in the past it has not been possible to place even crude limits of error on the approximations employed. Very recent theoretical advances, due mainly to Spruch and coworkers, may make it practical to estimate approximation errors, and therewith to decide how approximate wave functions should be modified in order to improve the accuracy of theoretical cross sections. It also is pointed out that very recent theoretical work suggests Born approximation may not be valid for rearrangement collisions at high energies, although this is a domain in which Born approximation has been and continues to be commonly employed. (Author)

Radioactivity

TID-11851 $1.00

Atomic Energy Commission. Div. of Biology and Medicine, Washington, D. C.
RADIOACTIVE FALLOUT DATA 1959. Collected from ten AEC installations, ed. by A. W. Klement, Jr. May 60, 112p.

PB 156 540 $6.60

Diamond Ordnance Fuze Labs., Washington, D. C.
GAMMA RAY DOSE DUE TO CAPTURE OF THERMAL NEUTRONS IN PURE MATERIALS, ALLOYS AND GLASS, by Herman Schulman. 4 May 60, 63p. 7 refs. Technical rept. TR-832; AD-237 674.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Gamma rays, Alloys, Materials, Glass, *Thermal neutrons, Radioactive decay, Dose rate, Neutron flux density, Radioactive isotopes, *Neutron capture, Radiological dosage.

A method of calculating the dose rate, in roentgens per hour, due to gamma rays released during the

radioactive decay of the capture products of thermal neutrons impinging upon pure materials is described. The method is specialized to the case of a pulsed-reactor source of thermal neutrons. Results for a time-integrated thermal flux of 10^{12} neutrons per square centimeter are tabulated for a point of observation one meter from the activated material, which is treated as a point source of gammas. Use is made of these results in calculating the "specific dose rate" (roentgens per hour per gram) for several activated alloys and glasses under similar conditions. A sample calculation sheet for alloys not included is appended. (Author)

UCRL-9511 $2.50

Lawrence Radiation Lab., U. of California, Berkeley.
ALPHA DECAY STUDIES IN THE FAMILIES OF THE LIGHT URANIUM ISOTOPES, by C. P. Ruiz. Rept. on Contract W-7405-eng-48. Apr 61, 149p.

IDO-16611 $0.75

Phillips Petroleum Co., Idaho Falls.
EFFECTS OF GAMMA RADIATION ON REACTIVITY MEASUREMENTS IN THE REACTIVITY MEASUREMENT FACILITY, by D. G. Proctor and G. K. Wachs. Rept. on Contract AT(10-1)-205. 28 Apr 61, 35p.

SC-4608(RR) $0.50

Sandia Corp., Albuquerque, N. Mex.
ENVIRONMENTAL BETA-GAMMA RADIOACTIVITY IN AIR AT SANDIA LABORATORY, by R. E. Womelsduff and J. E. Baker. First quarter 1961. May 61, 9p.

PHYSICS

PB 171 842 $0.50

Army Signal Research and Development Lab., Fort Monmouth, N. J.
A NEW RADIATION-RESISTANT HIGH-EFFICIENCY SOLAR CELL, by G. Mandelkorn, C. McAfee and others. Oct 60, 14p. 3 refs. USASRDL Technical rept. 2162; AD-247 184.

DESCRIPTORS: *Solar energy, *Photoelectric cells, Silicon, Phosphorus, *Crystals, Growth, *Radiation damage, Diffusion.

Details of a phosphorus-diffusion process for fabrication of high-efficiency silicon solar cells are presented. The phosphorus-diffused cells not only have high efficiencies but also a radiation resistance that is superior to commercial cells by at least an order of magnitude. Data on the electrical characteristics and radiation resistance of the cells are analyzed, and possible application of the new cells to satellites and atomic powered batteries is considered. (Author)

PB 156 579 $23.50

Army Signal Research and Development Lab., Fort Monmouth, N. J.
PROCEEDINGS OF THE UNCLASSIFIED SESSIONS OF SYMPOSIUM ON ELECTROMAGNETIC INTERFERENCE 19, 20 AND 21 NOVEMBER 1957 AT THE HOTEL BERKELEY-CARTERET, ASBURY PARK, NEW JERSEY. 15 June 58, 456p. 19 refs. AD-203 592.

This report released for sale to the public 3 July 61.

DESCRIPTORS: *Radio interference, Communication systems, *Electromagnetic theory, *Electromagnetism, Conferences.

Contents:
Introductory session
Looking through the problem
The Joint Spectrum Evaluation Group
Systems session
Transmitters and receivers session
Components and frequency control session
Antennas and propagation session
Tests and measurements session

PB 171 881 $2.25

Director of Defense Research and Engineering, Washington, D. C.
IMPORTANT AREAS OF ELECTRONIC RESEARCH. A COMPILATION OF STATEMENTS SUBMITTED BY LEADERS IN THE FIELD. Jan 61, 95p.

DESCRIPTORS: *Electronics, Research program administration, Reliability, Radiation damage, Materials, Solid state physics, Miniature electronic equipment, Microwave oscillators, Radio receivers, Electromagnetic waves, Acoustics, Antennas, Energy, Generators, Communication systems, Bioelectronics, Computers, Data processing systems, Applied mathematics, Instrumentation.

Contents:
Summary statement; Introductory statements; Reliability; Radiation environment; Materials research; Solid state; Microminiaturization; Laser and submillimeter-wave devices; Low-noise receivers; Electromagnetic and acoustic wave propagation; Antennas; Energy generation, storage, and conversion; Superpower microwave generators; Communications and command control; Bioelectronics, artificial intelligence, adaptive systems, pattern recognition, and related areas; Computers and data processing; Applied mathematics; Automated teaching; Technical information systems; Electronic instrumentation for other sciences; Sensors; Miscellaneous; General comments.

GEAP-3489 $1.75

General Electric Co., San Jose, Calif.
FREE-SURFACE SEPARATION OF STEAM AND WATER FOR APPLICATION IN A MARINE REACTOR AT 1000 PSIG, by A. G. Steamer and H. D. Ongman. Rept. on Contract AT(04-3)-189, PA #5. 13 July 60, 65p.

GEAP-3492 $1.00

General Electric Co., San Jose, Calif.
A STUDY OF THE EFFECTS OF SHIPS' MOTION ON FREE-SURFACE STEAM-WATER SEPARATION, by H. E. Weber and L. R. Glicksman. Rept. on Contract AT(04-3)-189, PA #5. 15 July 60, 37p.

KAPL-2145 $1.00

Knolls Atomic Power Lab., Schenectady, N. Y.
CONDUCTIVITY IN AGGREGATES, by A. E. Powers. Rept. on Contract W-31-109-eng-52. 6 Mar 61, 33p.

UCRL-6356 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
CALCULATION OF SPALL BASED ON A ONE-DIMENSIONAL MODEL, by M. L. Wilkins. Rept. on Contract W-7405-eng-48. 30 Mar 61, 13p.

PB 156 641 $4.60

Naval Ordnance Lab., White Oak, Md.
INTEGRAL SOLUTION OF THE SHALLOW WATER SOUND FIELD, by Neil R. Sorensen. Rept. on Shallow Water Propagation. 30 Nov 59, 46p. 5 refs. NAVORD rept. 6656; AD-234 531.

This report released for sale to the public 30 June 61.

DESCRIPTORS: *Underwater sound, Propagation, Mathematical analysis, *Integral equations, Transformations (Mathematics), Complex variables, Numerical methods and procedures, Digital computers.

A method is developed for the numerical evaluation of the integral solution to the wave equation for a point source in shallow water over-lying a hard liquid type bottom. This method is useful for intermediate horizontal ranges where satisfactory approximations to the sound field were not found. The integral cannot be evaluated directly because there are singularities in the integrand. Instead it was transformed into the complex plane in such a way that the resulting integrals and residues can be evaluated on a high speed digital computer. A limited number of calculations were made to illustrate the use of the numerical method. (Author)

Electronics

PB 156 330 $3.60

Missouri U., Columbia.
THERMIONIC EMISSION AND ELECTRICAL CONDUCTIVITY OF THE BaO OXIDE COATED CATHODE, by I. L. Sparks. Technical rept. no. 6 on Contract N7onr-292, T. O. 5. 15 Apr 51, 34p. 12 refs. ATI-155 773.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Oxide cathodes, *Thermionic emission, *Electrical conductance, Conductivity, Barium compounds, Oxides, Cathodes (Electron tubes), Electron tubes.

A retarding potential method is developed for measuring the electrical conductivity of normal oxide cathode coatings. Limitations of this method and advantages thereof are discussed. The conductivity of cathodes whose ratio of specific conductivity to emission current density is greater than 0.5 volt/cm can be studied. Simultaneous measurements of thermionic emission and specific conductivity were taken on samples of pure BaO and these results are discussed in terms of current oxide cathode theories. (Author)

PB 155 212 $3.60

Republic Aviation Corp., Farmingdale, N. Y.
ELECTROMAGNETIC DIFFUSION INTO A CYLINDRICAL PLASMA COLUMN DURING THE EARLY STAGES OF PINCH FORMATION, by Joseph L. Neuringer, Lester Kraus, and Herbert Malamud. Rept. on Contract AF 49(638)552. 16 Jan 61, 39p. 9 refs. PPL-TR-61-1; AFOSR-320; AD-252 394.

DESCRIPTORS: Electromagnetic properties, *Plasma physics, *Magnetic pinch, Energy, *Capacitors

The diffusion of electromagnetic energy into a cylindrical plasma column due to the discharge of the energy stored in a capacitor is formulated taking into account the effects of the capacitance and inductance of the discharge circuit. The discharge circuit reflects the linear pinch geometry in that the energy source is a charged condenser and the return lead is a perfectly conducting cylindrical shell concentric with and surrounding the plasma column. The plasma properties enter the formulation through an extended Ohm's law which includes the time rate of change of current density. Under the assumption that changes in the ionization density and collision frequency may be neglected, Maxwell's equations lead to a third-order linear partial differential equation for the diffusion current. An exact solution is obtained by Laplace transform techniques using appropriate initial and boundary conditions which take into account the finite external circuitry. The spatial and temporal behavior of the current density distribution as functions of the parameters which characterize both the circuit and the plasma are discussed and compared with that of an ordinary conductor obeying the simple Ohm's law. (Author)

PB 153 962 $9.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
QUARTERLY PROGRESS REPORT NO. 42 [FOR 1 MAR]-31 MAY 56, by J. B. Wiesner, G. G. Harvey and H. J. Zimmermann. Rept. on Contract DA 36-039-sc-64637. 15 July 56, 113p. 62 refs.

This report released for sale to the public 28 June 61.

DESCRIPTORS: *Electronics, *Microwaves, Microwave spectroscopy, Communications theory, Circuits.

Contents:
Physical electronics
Microwave gaseous discharges
Low temperature physics
Microwave spectroscopy
Nuclear magnetic resonance and hyperfine structure
Microwave electronics
Atomic beams
Statistical communication theory
Processing and transmission of information
Transistor circuits
Noise in electron devices
Irreversible thermodynamics
Mechanical translation
Sensory replacement
Communications biophysics
Network synthesis
Microwave theory
Circuit theory

PB 155 646 $8.10

Syracuse U. Research Inst., N. Y.
A THEORETICAL ANALYSIS TO PREDICT RECEIVED POWER, CORRELATION BANDWIDTH, CORRELATION DISTANCE, AND FADING RATE IN IONOSPHERIC SCATTER PROPAGATION, by Gerhard M. Baule. Final rept. on Contract AF 19(604)5489. July 60, 90p. 9 refs. S.U.R.I. rept. no. EE-655-608-TR1; AFCRL-TR-60-195; AD-254 280.

DESCRIPTORS: Power, Transmission, Electrons, Scattering, Density, Frequency, *Ionospheric propagation, Antennas, Mathematical analysis.

The formula for received power over transmitted power (P_R/P_T) when the received power is due to scattering from electron density fluctuations is developed heuristically. There is a simple dependence of P_R/P_T on the spectrum of the electron density fluctuations. A more precise derivation of P_R/P_T is given. This used only certain 'general' characteristics of the nature of the electron density fluctuations. Without specifying the exact nature of these fluctuations, it is shown that a close relation between the carrier frequency and the scattering angle exists. Some of the various equations obtained for the spectrum of the electron density fluctuations by means of turbulence theory are discussed. However, the extension of the derivation for P_R/P_T uses the results of a frequency-dependence propagation experiment. Because a fundamental relation does exist between the frequency and scattering angle, this is adequate to determine completely the formula for P_R/P_T except for a constant of proportionality. The equation for P_R/P_T is used to plot the received power for wide-beam antennas and for narrow-beam antennas. Also found are the time delays (a measure of the coherent bandwidth) for wide-beam antennas, space correlation distances, and a formula for the fading rate. (Author)

PB 156 320 $1.60

Thompson Products, Inc., Cleveland, Ohio.
[S-BAND WAVEGUIDE SWITCH MEASUREMENTS] by R. F. Schneider. Interim letter progress rept. no. 2, 15 Sep-15 Nov 54, on Contract AF 30(602)1252. 3 Dec 54, 11p. RADC-TN-55-21; AD-54 772.

This report released for sale to the public 28 June 61.

DESCRIPTORS: *Waveguide switches, Voltage, Standing wave ratios, Attenuation, Measurement.

Measurements of VSWR over the S band from 2.60 to 3.95 kmc in 0.20 kmc increments were made on waveguide switch RF head (G16S2AX) by the slotted-line method. On channel A, the VSWR exceeded the limit (1.05) at about midband (3.30 kmc). The midposition VSWR did not exceed 1.11. The substitution method was used to measure crosstalk which varied from 60.8 to 75.0 db. The attenuation (in decibels) of channel A was calculated a 3 frequencies by using the formula $-10 \log \frac{(r+1)}{(r-1)}$, where r is the VSWR existing in a shorted section. The r was calculated from the following relationship $r^2 = 1 + \frac{1}{\sin^2\left(\frac{\pi}{2}\frac{\Delta Xp}{\lambda g/2}\right)}$ where ΔXp is the distance between the 3-db points on either side of minimum attenuation, and $\lambda g/2$ is the distance between adjacent minima. For 2.60, 3.20, and 3.95 kmc, the attenuation was 0.033, 0.023, and 0.031 db, respectively.

PB 155 473 $5.60

University of Southern California. Engineering Center, Los Angeles.
INTERACTION BETWEEN A RADIO WAVE AND A PLASMA IN THE PRESENCE OF A UNIFORM MAGNETIC FIELD, by Toyoki Koga. Technical note on Contract AF 49(638)831. Jan 61, 53p. 7 refs. USCEC rept. 83-204; AFOSR-283; AD-253 452.

DESCRIPTORS: *Radio waves, *Plasma physics, Magnetic fields, Ions, Electrons, Molecules, Plasma oscillations, Particle trajectories, Propagation, Electron charge, Electric fields, Magnetohydrodynamics, Mathematical analysis, Moments, Gas ionization

Because of the imposed magnetic field, the effect of movements of ions is not to be neglected. Considering a plausible model of plasmas where molecules are partly ionized, we propose Boltzmann type equations for ions and electrons. By introducing "generalized moments" of the distribution functions of electrons and of ions, it is easy to solve the equations, obtaining the conductivity of a plasma to an oscillating electric field. The propagation of a radio wave in the plasma is investigated. There are seven frequencies which characterize the phenomena: (1) Larmor's frequencies of electrons and of ions, (ii) frequency of radio wave, (iii) plasma frequency and a similar one defined with respect to ions, and (iv) collision frequencies of electrons and of ions. The first approximation is treated where frequency (iii) is negligibly small compared with frequency (ii). In other words, the electric field induced by the group displacements of electrons and of ions is neglected. As special cases, Alfven's theory of hydromagnetic waves and Margenau's theory of radio waves in plasmas with no imposed magnetic field are included in the theory. For the second approximation, the field induced by the group displacements of electrons and of ions may be taken into account. (Author)

Molecular Physics and Spectroscopy

PB 155 456 $2.60

Akron U., Ohio.
INVESTIGATIONS OF VIBRATION-ROTATION LINE INTENSITIES OF INFRARED BANDS, by H. M. Hanson. Final rept. on Contract AF 19(604)6126. 30 Nov 60, 26p. 11 refs. AFCRL-208; AD-253 594.

DESCRIPTORS: *Infrared research, Vibration, Rotation, Intensity, Matrix algebra, Transformations (Mathematics), Ammonia, Molecules, *Wave analysis, Harmonic analysis, Theory, Functions, Quantum mechanics, Oscillation.

The research accomplished was concerned primarily with theoretical investigations of vibration-rotation line intensities of infrared bands. This involves an application of the contact transformation to evaluate the non-vanishing matrix elements of the electric moment. Preliminary work for the generalized polyatomic molecule is presented here in a modified form. Application to various systems was then undertaken including the specific case of the NH_3 molecule. (Author)

PB 156 577 $2.60

Lockheed Aircraft Corp., Marietta, Ga.
A HOLLOW PLASTIC BETA SPECTROMETER, by K. E. Mears and W. M. Cole. Rept. on Contract AF 33(600)38947. Nov 59, 29p. 3 refs. Nuclear rept. no. 73; AD-231 082.

This report released for sale to the public 30 June 61.

DESCRIPTORS: *Beta ray spectrometers, Design, Photomultipliers, Pulse height analyzers, Radioactive isotopes, Beta ray spectroscopy, Scintillation counters.

A study was made to determine the feasibility of using a small hollow plastic scintillator in conjunction with a photo-multiplier tube as a beta spectrometer. Conventional spectra of three beta emitting sources -- Cs^{137}, Tl^{204}, and a mixture of Sr^{90} and Y^{90} -- were obtained with the aid of a multiple channel pulse-height analyzer. From these energy spectra, Fermi plots were made. These Fermi plots were obtained by applying a correction factor to each point of the energy spectrum curve, which, in effect, changed the spectrum's curved shape into a straight line. By extending such straight line until it intersected the energy axis, the beta transition energy for each isotope was determined. The predicted, straight line Fermi plots were not obtained in actual practice in all of this work. The straight lines were somewhat distorted on the low energy ends. The causes and effects of such distortions are discussed in the report. Results obtained indicate that this inexpensive scintillation type spectrometer may be a useful addition to the laboratory for the identification of unknown beta emitters. (Author)

LAMS-2491 $0.50

Los Alamos Scientific Lab., N. Mex.
MODIFICATIONS TO CEC 21-620 MASS SPECTROMETER FOR INCREASED SENSITIVITY, by C. E. Landahl and R. G. Merryman. Rept. on Contract W-7405-eng-36. Feb 60, 20p.

PB 154 829 $6.60

Maryland U., College Park.
RESEARCH IN ELECTRON RESONANCE SPECTROSCOPY. Final rept. on Contract AF 18(600)1582. Dec 60, 66p. 41 refs. Technical rept. 207; AFOSR-217; AD-251 449.

DESCRIPTORS: *Nuclear spins, Free radicals, Electrons, Nuclear magnetic resonance, *Resonance absorption, *Quantum mechanics, Nuclear magnetic moments, Hyperfine structure, Paramagnetic resonance, Ultraviolet radiation, Hydrocarbons, Nitrogen compounds, Oxides, Organic compounds, Aldehydes, Ketones.

Contents:
Electron spin resonance spectra of ultraviolet irradiated compounds:
II. Nitrogen tetroxide and organic nitro-compounds
III. Aldehydes and ketones
Line widths in electron spin resonance spectra
Electron spin resonance line shapes for solids having non-isotropic g-factors
(See also PB 140 505, PB 153 291)

PB 155 783 $1.60

Oslo U. (Norway).
CRYSTAL STRUCTURE OF THE 1:1 ADDITION COMPOUND FORMED BY 4-PICOLINE AND IODINE, by O. Hassel. Technical (scientific) note no. 3 on Investigation of molecular structures, Contract AF 61(052)71. 23 Dec 60, 16p. 10 refs. AFOSR-290; AD-254 978.

DESCRIPTORS: *Complex compounds, Crystal structure, Molecular structure, *Iodides, *Pyridine derivatives, Iodine, Chemical reactions, X-ray diffraction analysis.

The crystal structure of an equimolecular addition compound of 4-picoline and iodine has been determined by X-ray methods at temperatures about -40° C. The space group is $P2_1/c$, the lattice parameters: a = 4, 72 Å; b = 9, 05 Å; c = 21, 55 Å; β = 101°. The I-I-N arrangement is linear with the I-I distance 2, 83 Å and the I-N distance 2, 31 Å. (Author)

Optics

PB 171 770 $0.50

Bureau of Naval Weapons, Washington, D. C.
MACROSCOPE SUPPORT. BuWeps-BuShips Calibration Program. 10 Dec 59, 10p. [Secondary Standards Lab.] Fabrication Instructions TDO D-26.

DESCRIPTORS: *Optical instruments, Calibration, Instrumentation, Manufacturing methods.

The Macroscope Support was designed to provide a convenient method of adjusting the Bausch and Lomb No. 31-29-70, 10X Macroscope with optimum flexibility when used in conjunction with the Ice Point Apparatus.

PB 155 644 $1.60

Colorado U., Boulder.
BIREFRINGENCE IN A STRAINED VISCOELASTIC FLUID UNDER STEADY STATE ROTARY CONDITIONS, by Stanley J. Gill and Frederick R. Dintzis. Rept. on Contract AF 49(638)310. Feb 61, 16p. 5 refs. AFOSR-399; AD-254 242.

DESCRIPTORS: *Fluids, *Fluid mechanics, Viscosity, Elasticity, Optics, *Refraction, Solutions, Cellulose, Styrenes, Polymers, Theory, Mathematical analysis, Test equipment, Instrumentation, Stresses, Rotation, Deformation

The theory and apparatus involved in a study of the birefringence of a strained viscoelastic fluid are discussed. Consideration was given to a material in a state of continuous rotary strain. Methods of mathematical analyses of the strain within the fluid subjected to a rotated elliptical boundary, and its birefringence were reviewed. The experimental apparatus was composed of a thin walled Teflon tube rotating inside of a stationary brass tube squeezed to form an elliptical cross section. Optical windows and other mechanical devices were at either end. Birefringence and axes orientation measurements may be made with the Soleil-Babinet compensator. Results are presented for carboxymethyl cellulose and polystyrene solutions. Accuracy depended on factors such as solution concentration, temperature, and speed of rotation. Theoretical expectations were realized; steady state retardation increased with rotation speed; the angular orientation of the principal optic axes was found to depend on rotation speed.

PB 156 468 $8.10

[Thompson] Ramo-Wooldridge Corp., Los Angeles, Calif.
INFRARED SKY BACKGROUND INVESTIGATION. Semiannual rept. no. 2 on Contract AF 33(600)30489. 30 Nov 56, 82p. 4 refs. RW 1631.84; AD-128 528.

This report released for sale to the public 28 June 61.

DESCRIPTORS: *Sky, Infrared radiation, *Sky brightness, Determination, *Radiometers, Calibration

This report is divided generally into three sections to include (1) radiometric and gradient meter calibration data, (2) the analysis and design of the "contrast meter," and (3) radiometer and gradient meter field measurements.

Solid State Physics

PB 155 799 $2.60

Cornell U., Ithaca, N. Y.
THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF THE ATOMIC PHENOMENA OCCURRING ON AND NEAR THE SURFACES OF SOLIDS, by Benjamin M. Siegel. Final rept. 1953-31 Dec 60, on Contract AF 18(600)674. 10 Mar 61, 29p. 9 refs. AFOSR-TR-383; AD-254 688.

DESCRIPTORS: *Electron diffraction analysis, Physical properties, *Atomic structure, *Surfaces, *Atoms, Electron microscopy, Controlled atmospheres, Field emission, Vacuum apparatus, Corrosion, Oxidation, *Solid state physics, Solids.

Efforts were directed to obtaining an understanding of properties and phenomena such as structure, oxidation, corrosion, and electron emission. Ultra high vacuum techniques were employed for obtaining controlled surface conditions. Efforts were concentrated on studies utilizing high resolution electron optical devices such as the electron microscope and electron diffraction camera. The atomic structure and surface morphology of surfaces and evaporated films were investigated by these methods. Surface interactions during oxidation were studied as well as the nucleation and growth of films deposited on substrates by evaporation. (Author)

PB 171 845 $1.75

Denver Research Inst., Colo.
LITERATURE SURVEY OF SELECTED SEMICONDUCTOR PROPERTIES, by Charles E. Lundin, Richard D. Seibel, and Richard W. Sullivan. Scientific rept. no. 1, 1 Apr-1 Dec 60, on Contract AF 19(604)7222. 1 Dec 60, 64p. 81 refs. AFCRL-4; AD-254 124.

DESCRIPTORS: *Semiconductors, *Thermodynamics, *Bibliography, Intermetallic compounds, Silicon, Germanium compounds.

A literature survey was conducted concerning selected thermodynamic data of semiconductor materials. The data are compiled herein accompanied by their respective references. The data presented as a result of the search are as follows: (1) thermodynamic properties of Group IIA, IIIB, IVB, and VB elements; (2) thermodynamic properties of intermetallic compounds between Groups IIA and IVB and Groups IIIB and VB elements, and; (3) distribution coefficients and solid solubilities of solute elements in silicon and germanium.

PB 155 195 $2.60

Hebrew U. (Israel).
A STUDY OF THE INTERNAL FIELDS ACTING ON IRON NUCLEI IN IRON GARNETS, USING THE RECOIL-FREE ABSORPTION IN Fe^{57} OF THE 14.4 KEV GAMMA RADIATION FROM Fe^{57m}, by R. Bauminger, S. G. Cohen and others. Technical note no. 2 on Contract AF 61(052)347. Dec 60, 23p. 13 refs. AFOSR-225; AD-251 235.

DESCRIPTORS: *Garnets, *Iron compounds, Silicates, Absorption, Spectrographic analysis, Cobalt, Radioactive isotopes, *Lattices, Gamma rays, Yttrium compounds, Dysprosium, *Nuclei, Gamma ray spectroscopy.

The shape of the recoil-free absorbtion spectrum obtained in iron garnet absorbers has been investigated, using, as a source, a Co^{57} source embedded in stainless steel. The results confirm the existence of two iron sub-lattices each showing a Zeeman structure characterized by different parameters.

PB 155 483 $3.60

Honeywell Research Center, Hopkins, Minn.
THE OPTICAL AND ELECTRICAL PROPERTIES OF SINGLE CRYSTAL TELLURIUM. Quarterly rept. no. 1 on Contract AF 49(638)908. 31 Aug 60, 38p. 14 refs. Serial no. 35900; AFOSR-284; AD-253 396.

DESCRIPTORS: *Semiconductors, Electrical properties, *Tellurium, Single crystals, Optics, Resistance, Temperature, Impurities, Lattices, *Crystal structure, Magnetic properties.

Contents:
Resistivity & mobility in extrinsic tellurium, by D. Long and B. Kizilos
The galvanomagnetic coefficients of tellurium at 4.2 K, by Donald Long and Allen Nussbaum
Recombination processes in tellurium, by J. S. Blakemore
Enantiomorphism and optical activity in tellurium, by K. C. Nomura

PB 155 662 $2.60

Illinois Inst. of Tech., Chicago.
DIRECT STUDY OF IMPERFECTIONS IN NEARLY PERFECT CRYSTALS, by Robert H. Bragg (Armour Research Foundation) and Leonid V. Azaroff. Rept. on Contract AF 49(638)425. 1 Mar 61, 27p. 19 refs. AFOSR-308; AD-254 141.

DESCRIPTORS: *X-ray diffraction analysis, *Crystals, *Crystal structure, *Lattices, Deformation, Single crystals, Measurement, Silicon.

The Laue focussing geometry employed by Guinier and Tennevin (Acta Cryst. 2:133, 1949) to observe imperfections in deformed crystals can be used to study imperfections in nearly perfect crystals as well by interpreting the observed intensity distributions in terms of the dynamical theory of X-ray diffraction. A rather perfect silicon crystal was examined by this method. It was found that neighboring regions of the same crystal slice consist of mosaic blocks approximately 1/1000 cm thick whose relative tilts range from 8 to 12 seconds of arc. As suggested by the more qualitative etch pit densities and diffraction line breadths, the central portions of the crystal contains larger blocks with smaller relative misorientations than those lying near the surfaces of the crystal. It is thus possible to use this method to accurately map the distribution of imperfections throughout as small or as large a region of a single crystal as is desired. (Author)

PB 155 529 $1.10

Illinois U., Urbana.
BASIC AND APPLIED RESEARCH ON SEMICONDUCTORS, by E. K. Weise. Final rept. for 1 Feb 58-31 Jan 61 on Contract AF 49(638)212, continuation of Contract AF 33(038)12644. 28 Feb 61, 6p. 12 refs. AFOSR-509; AD-253 674.

DESCRIPTORS: *Semiconductors, Magnesium, *Titanates, Thermoelectricity, Temperature, Materials, *Solid state physics, Solids, Electric potential, Mathematical analysis, Applied mathematics, Electric current.

The electrical conductivity properties of magnesium, calcium, strontium, and barium titanates were investigated as functions of composition and temperature. For the measurement of the donor concentration, a weighing method was used. Its sensitivity was determined by the available, analytical balance and in order to overcome this limitation an independent magnetic method was tried; this method seemed to lead to a sensitivity higher than with the weighing method by one to two powers of ten. (Author)

PB 150 210 $3.60

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
FORMATION OF Fe^{4+} IN THE SYSTEM $LaFeO_3$-$SrFeO_3$, by J. Stanley Waugh. Rept. on Contract Nonr-1841(10). Aug 60, 37p. 23 refs. Technical rept. 152; AD-241 520.

DESCRIPTORS: *Lanthanum compounds, *Strontium compounds, *Ferrites, Electrical conductance, Electrical properties, Magnetic properties, *Semiconductors, Antiferromagnetism; Iron compounds, Ions, Oxides.

The presence of tetravalent iron in the system $LaFeO_3$-$SrFeO_3$ was demonstrated by measurements of the electrical conductivity, thermoelectric voltage, optical absorption, magnetization, and by chemical analysis. $LaFeO_3$, an antiferromagnetic, has a conductivity of 10^{-5} ohm^{-1}-cm^{-1} at room temperature and acts as a semiconductor with an activation energy of ca. 0.3 ev. Mixed crystals containing La^{3+} and Sr^{2+} ions are good semiconductors with conductivities ranging as high as 10^{2} ohm^{-1}-cm^{-1} at the composition $(La_{0.5}Sr_{0.5})FeO_3$. The activation energy decreases from 0.3 ev for $LaFeO_3$ to 0.03 ev for $SrFeO_3$. The conductivity, magnetization, and optical absorption exhibit a maximum at the equimolar composition $[(La_{0.5}Sr_{0.5})FeO_3]$. The thermoelectric voltage changes sign at this composition from positive in the $LaFeO_3$-rich to negative in the $SrFeO_3$-rich region. Chemical analysis shows that, as might be expected, $SrFeO_3$ is not stoichiometric when fired at one atmosphere of oxygen pressure but is oxygen deficient (composition ca. $SrFeO_{2.75}$). (Author)

PB 155 784 $4.60

Liege U. (Belgium).
NUCLEAR QUADRUPOLE RESONANCE IN IRRADIATED CRYSTALS AND IN A SEMI-CONDUCTOR (PART I) ORIGIN OF FREE RADICALS IN CARBONACEOUS ROCKS (PART II) by Jules Duchesne, M. Read, and J. Depireux. Technical final rept. on Contract AF 61(052)167. 15 Jan 61, 50p. 30 refs. AFOSR-416; AD-254 956.

DESCRIPTORS: *Radiation damage, Organic materials, *Crystals, *Semiconductors, *Nuclear resonance, Solids, Gamma rays, X-rays, Neutrons, *Free radicals, Radiochemistry, Quadrupole moments, Organic compounds, Test methods, Sensitivity, *Rock, *Coal, Paleoecology, Petroleum, Ultraviolet spectroscopy, Spectrographic analysis, Solutions.

PART I: The intensity decrease of quadrupole lines is used as a method for the study of the damage induced by high energy radiation in solid matter. The method is successfully applied to a semi-conductor and, by the study of $AsBr_3$, the results have been shown to be independent of the nucleus, the line of which is chosen for the measurement. Thermally treated irradiated compounds, which are thereafter reirradiated, are especially considered; the origin of radioprotection phenomena and the behavior of the interactions between centers perturbed by irradiation are studied further. A generalization is proposed for this method by substituting the study of solid solutions for that of pure compounds, thus allowing the determination of radioresistance of any compound inclusive of the polymers. PART II: The problem of the genesis of free radicals encountered in coals, lignites, peats and petroleum is analysed. Two hypotheses concerned with the botanical origin and the effect of natural radioactivity are put forward. (Author)

PB 155 632 $8.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOLID STATE RESEARCH. Quarterly progress rept. 15 Oct 60-15 Jan 61, on Contract AF 19(604)7400. 15 Jan 61, 99p. 85 refs. AFCCDD-TN-61-1000; AD-254 036.

DESCRIPTORS: Solids, *Semiconductors, Design, Magnetic materials, Magnetic properties, Germanium, Chemical properties, Optics, Infrared radiation.

Contents:
Semiconductor device design
Chemistry
Materials research
Band structure of solids
Microwave and magnetic properties of solids
Magnetic materials
Magnetic films
Semiconductor components
Optics and infrared
(See also PB 171 537)

PB 155 465 $3.60

Mellon Inst., Pittsburgh, Pa.
VIBRATIONAL EXCITONS. II. DEGENERATE VIBRATIONS, by R. M. Hexter. Rept. on Contract AF 49(638)542. 17 Mar 61, 38p. 18 refs. AFOSR-472; AD-253 622.

DESCRIPTORS: *Molecules, Vibration, Theory, Crystals, Crystal structure, Wave analysis, Excitation, Lattices, Molecular spectroscopy, Benzenes.

The energy of the first vibrational excited state of a molecular crystal is derived in terms of exciton theory, for the special case of an exciton state derived from a doubly degenerate molecular excited state. We also treat the case where the degeneracy is lost due to the anisotropic environment of the molecule in the crystal. From the several allowed values of such energies, the correlation field splittings in such bands are derived. An expression is also derived for the local field or site splittings, observable in solid solutions of molecules in their isotopically substituted modifications. This expression indicates that there may be a concentration dependence to such site splittings, the existence of which has been heretofore unsuspected. A new interpretation of such splittings, in the light of this indication, is offered. Finally, the effects of isotopic substitution in such crystals are discussed and several rules of isotopic invariance are derived. An appendix is included which treats as an example the vibrational fundamentals of crystal benzene derived from the e_{1u} molecular modes. (Author)

PB 156 329 $5.60

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
INVESTIGATION ON SEMICONDUCTING MATERIALS, by Leon W. Zelby and Jurij Maczuk. Final rept. 15 Sep 59-30 Nov 60, on The Investigation of Properties of Contacts on Semiconductors, Contract DA 36-039-sc-78232. 31 Dec 59, 60p. 20 refs. Moore School rept. no. 60-12; AD-234 982.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Semiconductors, Metals, Electrical properties, Silicon, Crystals, Single crystals.

The properties of metallic contacts on semiconducting materials, particularly Si and compounds of group III-IV elements were investigated to (1) establish techniques for measuring lifetime with particular reference to short lifetime materials, and (2) study the dependence of injection ratio and measured lifetime on surface preparation. Nickel which was plated on p-type Si lapped with optical powder was the most active contact materials; it produced the largest photovoltage (magnitude) and the best rectification ratio. Consistent differences between the results and their magnitude for surfaces lapped on emery and optical powder may indicate that the more the surface is disturbed mechanically, the more inactive is the nature of the contact. Injection, injection in reverse, and extraction were 3 types of activity clearly distinguished, reproducible, but not wholly exclusive, i.e., under some conditions, injection and extraction occurred during the pulse, with injection being dominant. The nature of the contact is strongly dependent on the metal used (or possibly the plating solution responsible for the type of interface between the metal and semiconductor), confirming dc rectification data in the literature.

ORNL-3108 $2.50

Oak Ridge National Lab., Tenn.
THE CARRIER-RECOMBINATION BEHAVIOR AND ANNEALING PROPERTIES OF RADIATION-INDUCED RECOMBINATION CENTERS IN GERMANIUM, by O. L. Curtis, Jr. and J. H. Crawford, Jr. Rept. on Contract W-7405-eng-26. 125p.

PB 152 983 $7.60

Polytechnic Inst. of Brooklyn, N. Y.
HIGH TEMPERATURE CRYSTAL CHEMISTRY. Final rept. for 1 July 54-30 Sep 60 on Contract AF 18(600)1193 [1960] 79p. 72 refs. AFOSR-382; AD-252 224.

DESCRIPTORS: *Crystals, *Metallic compounds, *Metallic crystals, Powder metallurgy, *Single crystals (Metallurgy), Phase studies, Solids, Solutions, Electrical properties, Crystal structure, High temperature research, Metals, Alloys, *Rare earth compounds, Chemical properties, Transition elements, Bronze, Silicides.

Contents: Alkali tungsten bronzes and related compounds; Rare earth germanides; Atomic parameters in garnets; Phase transformations of the sodium tungsten bronzes; Phase transitions in ferroelectric mixed oxides with the perovskite structure; Transition metal silicides and germanides; Position parameters and thermal motions of O atoms in $CaCO_3$; Thermal behavior of O atoms in $NaNO_3$; and Thermal effects and electron density distribution in zincblende.

The thermal expansion and phase transitions of WO_3, pub. in Acta Crystallographica 9:475-426, June 56.

The thermal expansion of cubic sodium tungsten bronzes, pub. in Acta Crystallographica 9:477-478, June 56

Study of phase transitions in WO_3 with high temperature x-ray diffractometer, pub. in Jnl. of Applied Physics 28:1272-1275, Nov 57

New group III-group V compounds: BP and BAs, pub. in Acta Crystallographica 11:310, Apr 58

Rare earth metal "disilicides", pub. in the Jnl. of Physical Chemistry 63:616-619, Apr 59

Polymorphism of rare earth disilicides, pub. in the Jnl. of Physical Chemistry 63:2073-2074, 1959

PB 155 287 $3.60

Yeshiva U., New York.
ELECTRON TRANSPORT IN A SEMICONDUCTOR, by H. L. Frisch (Bell Telephone Labs., Inc.) and J. L. Lebowitz. Rept. on Contract AF 49(638)753. [1960] 35p. 10 refs. AFOSR-434; AD-252 636.

DESCRIPTORS: *Semiconductors, *Electrons, Scattering, Solids, *Phonons, Impurities, Statistical distributions, Lattices, Conductivity, Mathematical analysis, Green's function.

The linear transport properties of electrons in a solid are investigated when both phonon and impurity scattering are important. The problem is treated for the case where Maxwellian statistics apply and the electrons are described by a classical distribution function in position and velocity, f(r, v) satisfying a space dependent equation in which the phonon scattering only is described by a linear Boltzmann type collision term. This equation is solved formally in the presence of a weak external electric field in a form convenient for perturbation expansions in the relative strength of the different scattering mechanisms, some of which are carried out explicitly. When the kernel describing collision with phonons is randomizing the change in mobility due to the presence of impurities is always negative. (Author)

Theoretical Physics

PB 171 855 $1.00

Avco-Everett Research Lab., Mass.
PHYSICAL PRINCIPLES OF MAGNETOHYDRODYNAMIC POWER GENERATION, by Richard J. Rosa. Rept. on Contract AF 04(647)278. Jan 60, 37p. 20 refs. Research rept. 69; AFBMD-TR-60-36; AD-251 479.

DESCRIPTORS: Magnetohydrodynamics, Gas ionization, Plasma jets, *Power supplies, Conductivity, Plasma physics.

Some phenomena apt to be of importance in a magnetohydrodynamic power generator are discussed. Particular attention is given to the effects of seeding on gas conductivity and to the Hall effect as it appears in nonuniform gases of finite extent. An experimental 10-kw magnetohydrodynamic generator is described. An arc wind tunnel or plasma jet is used as a convenient laboratory furnace to heat the working fluid. The generator's performance, including some observed Hall effects, is presented and discussed. (Author)

PB 155 604 $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
THE EFFECT OF COLLISIONS ON TWO-STREAM INSTABILITIES IN A PLASMA, by D. A. Tidman and George Weiss. Rept. on Contract AF 18(600)1315. Mar 61, 29p. 10 refs. Technical note BN-234; AFOSR-423; AD-254 030.

DESCRIPTORS: *Plasma physics, *Electrons, *Ions, Transformations (Mathematics), Mathematical analysis, *Scattering.

The effect is investigated of a small amount of two-body scattering on the two-stream instability that occurs in a plasma of contrastreaming electrons and ions. This is done by assuming the electron-ion collision frequency is small and making a perturbation expansion in this quantity. Contrary to what one might expect we find that the first correction in this small collision frequency increases the growth rate of unstable perturbations in the streams. (Author)

PB 155 605 $1.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
RADIATION BY A LARGE AMPLITUDE PLASMA OSCILLATION, by D. A. Tidman and George H. Weiss. Rept. on Contract AF 18(600)1315. Mar 61, 12p. 1 ref. Technical note BN-236; AFOSR-479; AD-254 031.

DESCRIPTORS: *Plasma physics, Ions, Energy, *Perturbation theory, Radiation instruments, *Electromagnetic waves.

A plasma oscillation is considered which is initially purely longitudinal in a plasma of zero temperature. Using second order perturbation theory we then calculate the amount of electromagnetic radiation produced by the wave. (Author)

PB 154 932 $3.60

Institute for Fluid Dynamics and Applied Mathematics U. of Maryland, College Park.
RADIO EMISSION BY PLASMA, OSCILLATIONS IN NONUNIFORM PLASMAS, by D. A. Tidman and George H. Weiss. Rept. on Contract AF 18(600)1315, continuation of Contract AF 04(647)309. Feb 61, 31p. 4 refs. Technical note BN-230; AFOSR-306; AD-251 573.

DESCRIPTORS: *Plasma oscillations, Density, Electromagnetic waves, *Radio waves, Electric fields, Magnetic fields, Microwaves, Integral transforms.

Calculations were conducted on the electromagnetic radiation emitted when a field of longitudinal plasma oscillations is incident on a localized fluctuation in density in a plasma. Use was made of the collisionless Boltzmann equation to describe the electron component of the plasma and compare the results with those previously obtained using the moment equations for this problem. (Author)

PB 155 866 $3.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
THE WAVE MOTIONS OF SMALL AMPLITUDE IN A FULLY IONIZED PLASMA. PART III. WITH A TRANSVERSE APPLIED MAGNETIC FIELD, by S. I. Pai. Rept. on Contract AF 49(638)401. Mar 61, 35p. 2 refs. Technical note BN-235; AFOSR-542; AD-254 957.

DESCRIPTORS: *Plasma physics, Magnetic fields, Ions, *Wave transmission, Magnetohydrodynamics, Electrons, Perturbation theory, Mathematical analysis, Electrical conductance, Ion accelerators, Cyclotrons.

Wave motions of infinitesimal amplitude in a fully ionized plasma under a uniform transverse magnetic field have been analyzed by means of a two-fluid theory. One basic transverse wave and two basic longitudinal waves, as they were found for the case without external magnetic field, appear to interact with one another through the influence of this applied magnetic field and there are three resultant waves. In an ideal plasma, in the low frequency range, only one of the three resultant waves is undamped. When the ion cyclotron frequency is much smaller than the ion plasma frequency, this undamped wave reduces to the effective sound wave of ordinary magneto-gasdynamics. If the ion cyclotron frequency is not small, the speed of propagation of this wave is larger than the effective sound speed of magneto-gasdynamics. On the very high frequency range, all the three waves are undamped. In a certain intermediate frequency range two of the waves are undamped. Finally the effects of finite electrical conductivity on these waves are briefly discussed. (Author)

UCRL-9601 $2.25

Lawrence Radiation Lab., U. of California, Berkeley.
EXPERIMENTAL STUDY OF HYDROMAGNETIC WAVES IN PLASMA, by A. W. DeSilva. Rept. on Contract W-7405-eng-48. 17 Mar 61, 104p.

PB 155 528 $2.60

Maryland U., College Park.
PLASMA SHEATH AND SCREENING AROUND A RAPIDLY MOVING BODY, by E. H. Walker. Doctoral thesis. Rept. on Contract AF 49(638)899. Mar 61, 29p. 9 refs; AFOSR-460; AD-253 850.

DESCRIPTORS: *Plasma physics, Particles, *Satellite vehicles, Guided missiles, *Ions, Hypervelocity vehicles, Electrostatic fields, Electric fields, Wake, Shielding.

The distribution of the potential and the charge density is derived quite generally for a stationary charged sphere and for a charged body moving rapidly through a plasma. Previous treatments were restricted to the cases where either the body's potential was small, being limited to less than five times the plasma temperature, or the body was small compared to the Debye length, or the body was moving slowly compared to the ion velocity. (Author)

PB 155 661 $3.60

Minnesota U., Minneapolis.
THE ONE-DIMENSIONAL PLASMA, by Stephen Prager. Technical rept. no. 2 on Contract AF 49(638)720. 17 Mar 61, 34p. 2 refs. AFOSR-431; AD-254 140.

DESCRIPTORS: Mathematical analysis, Equations, *Plasma physics, *Thermodynamics, Mixtures, Electrostatic fields, Electrostatics, Theory, Electric potential, Quantum statistics, Particles, Integral equals.

The interaction of two charges in one dimension corresponds to the three dimensional interaction of two uniformly charged parallel plates. The partition function for an electrically neutral system of such charges can be obtained rigorously, without recourse to any approximations. The resulting thermodynamic functions agree with those predicted by the one-dimensional Debye-Huckel theory in the limit of high pressures, but considerable deviations appear as the pressure is reduced. At very low pressures the system behaves as though made up of neutral molecules. The effect of an external electrostatic field is discussed, and the treatment is also extended to plasma mixtures. (Author)

PB 155 211 $1.60

Republic Aviation Corp., Farmingdale, N. Y.
A DC GLOW MODEL OF THE FORMATION OF THE MAGNETIC PISTON, by L. Aronowitz and P. Mostov. Rept. on Contract AF 49(638)552. Dec 60, 15p. 3 refs. PPL-TR-60-21 (241); AFOSR-319; AD-252 393.

DESCRIPTORS: *Glow discharges, Metals, *Magnetic pinch, *Electrodes, Direct current, Electric currents.

The formation of the magnetic sheath or magnetic piston in a linear pinch discharge between metal electrodes is often analyzed by methods that ignore the role of the electrodes. However, in many regimes of practical interest, electrode effects may play a dominant role. The results of dc discharge phenomena are incorpo-

rated to account for these electrode effects. A method is developed to compute current density as a function of position and time in the early stages of a pinch discharges. (Author)

PB 155 420 $3.60

Weizmann Inst. of Science (Israel).
THE MOMENT OF INERTIA OF ROTATING NUCLEI, by Amnon Katz and John Blatt. Technical note no. 6 on Contract AF 61(052)337. 1 Nov 60, 34p. 11 refs. AFOSR-169; AD-253 341.

DESCRIPTORS: *Nuclei, Nuclear magnetic moments, *Superconductivity, Superconductors, Cooling, Magnetic fields, Magnetic effects, *Nuclear shell models, Rotation, Mathematical analysis, Nuclear spins, *Quantum statistics.

Application of methods devised for the Meissner effect by J. M. Blatt (Prog. Theor. Phys. 24:851, 1960) leads to a consistent calculation of the moments of inertia of superfluid nuclei. (Author)

PB 155 424 $1.60

Weizmann Inst. of Science (Israel).
ON THE TREATMENT OF PERTURBATION IN A SYSTEM OF PAIRED FERMIONS, by Amnon Katz. Technical note no. 9 on Contract AF 61(052)337. 1 Jan 61, 14p. 8 refs. AFOSR-227; AD-253 344.

DESCRIPTORS: Particles, *Quantum statistics, *Superconductivity, Superconductors, Nuclear magnetic moments, Cooling, Magnetic fields, Magnetic effects, *Nuclear shell models, *Nuclei, Nuclear spins.

A straightforward variational calculation with BCS wave functions yields expressions formerly obtained by Migdal (Nuclear Physics 13:655, 1959) and Blatt (Prog. Theor. Phys. 24:851, 1960) by more complicated methods. As was shown by Migdal and Blatt, these expressions lead to a correct rotational moment of inertia of the system at the limit of a large system, to a correct mass in the pushing model and to a gauge invariant description of the Meissner effect. (Author)

PB 155 427 $2.60

Weizmann Inst. of Science (Israel).
PAIRING AND QUADRUPOLE FORCES IN A TWO DIMENSIONAL SOLUBLE MODEL, by H. J. Lipkin. Technical note no. 7 on Contract AF 61(052)337. 1 Nov 60, 22p. 13 refs. AFOSR-170; AD-253 342.

DESCRIPTORS: *Nuclear shell models, *Quantum mechanics, Quadrupole moments, Nuclear moments, Quantum statistics, Particles

A simple phenomenological nuclear model was proposed by the Copenhagen group as one describing many of the observed features of low energy nuclear spectra. This is the j-j coupling shell model, with a residual interaction consisting of a quadrupole force and a pairing force. These two components are not claimed to be the major part of the real residual two-body force. Rather they are pictured as playing a dominant role in low energy spectra, where correlations of the quadrupole or pairing type seem to produce coherent effects which emphasize these particular components of the force.) (Author)

Thermodynamics

PB 156 473 $7.60

Airesearch Mfg. Co., Los Angeles, Calif.
SINGLE TUBE HEAT TRANSFER TESTS GASEOUS AND LIQUID HYDROGEN, by C. C. Wright and H. H. Walters. Rept. on Contract AF 33(600)34222. Aug 59, 73p. 4 refs. WADC Technical rept. 59-423; AD-228 875.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Hydrogen, Liquified gases, *Heat transfer, *Cryogenics, Tests, Heat exchangers.

Single tube heat transfer tests are described which were conducted with gaseous and liquid hydrogen. In the gaseous hydrogen tests the test unit was operated as a counterflow heat exchanger in which ambient temperature helium was used to heat normal hydrogen gas at a temperature of about 100° R and a pressure of 700 psia. In the liquid hydrogen tests heat was applied to the outer surface of the copper tube with an electric resistance heating element, while saturated liquid was allowed to flow through the tube. Test results were obtained in both the nucleate boiling region and the stable film boiling region. The gaseous hydrogen test results agreed within ±20% of the predicted results. No data was obtained near the critical point of hydrogen. The liquid hydrogen tests gave interesting information on forced convection boiling. At a pressure of 1.6 atm and a Reynolds number of about 275,000, the peak heat flux for nucleate boiling occurred at a temperature difference of about 3.6°R, and the peak heat transfer coefficient was about 5900 Btu per (hr ft°R). The lowest temperature differences in the stable film boiling range were about 40° to 50°R and the heat transfer coefficients were only about ten % as high as the peak coefficients in the nucleate boiling range. The film boiling heat transfer coefficients were very nearly constant over the range of temperature differences that were obtained (40° to 300°R). Test procedures, test apparatus, and methods of data reduction are also described. The test data is summarized in both tabular and graphical form. (Author)

PB 155 863 $2.60

Allied Research Associates, Inc., Boston, Mass.
THE ADJOINT HEAT CONDUCTION PROBLEM FOR SOLIDS, by Theodore R. Goodman. Rept. on Contract AF 49(638)839. Apr 61, 25p. 5 refs. AFOSR-520; AD-254 769.

DESCRIPTORS: *Heat transfer, *Thermodynamics, Mathematical analysis, Integration, Theory, *Solids, Fluids, Gases, Liquids, Boundary layer.

A new mathematical method is presented for solving the linear transient heat conduction equation for

solids. Its primary advantage lies in the fact that having solved an appropriate adjoint heat conduction problem, the solution to a large class of physical heat conduction problems can immediately be expressed in terms of a quadrature. A number of results are presented by way of example for one-dimensional problems. In particular a three-temperature equation is derived which relates the temperature-time history at three successive boundaries of a composite slab. A numerical example using the three-temperature equation is worked out for the steady case. (Author)

PB 153 977 $10.10

Brown U., Providence, R. I.
HEAT TRANSFER IN SEPARATED FLOWS. PART I. EXPERIMENTS ON HEAT TRANSFER FROM AN INFINITE FLUFF PLATE TO AN AIR STREAM. PART II. SURVEY ON SEPARATED FLOWS, WITH SPECIAL REFERENCE TO HEAT TRANSFER, by H. H. Sogin, Kurt Burkhard and P. D. Richardson. Rept. on Research on Aerodynamic Flow Fields, Contract AF 33(616)5756. Jan 61, 125p. 126 refs. ARL-4; AD-254 681.

DESCRIPTORS: *Heat transfer, Bibliography, *Fluid mechanics, *Turbulent flow, Gas flow, Aerodynamics, Blunt bodies, Measurement, Instrumentation, Sheets.

The measurement of local rates of heat transfer on the front and back surfaces of an infinite flat plate strip oriented normal to an air stream at atmospheric pressure and temperature is discussed. The chord length of the plate is 6.75 in., and its wind-tunnel blockage ratio is 0.211. The data, reduced with property values at the mean film temperature, are well correlated by an equation of the type HL/K is similar to RE to the 2/3 power, where H is the local coefficient of heat transfer, L is the chord length of the plate, K is the thermal conductivity, and RE represents Reynolds number. Effects of turbulence grids and of a splitter plate at the rear are also included. The plate constitutes a basic apparatus for the study of heat transfer to regions of separated flow. The present knowledge of the onset, development, and nature of separated flows, together with the corresponding heat transfer characteristics is outlined. An extensive bibliography is given. (Author)

PB 155 441 $3.60

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena.
SPECTROSCOPIC METHODS OF TEMPERATURE MEASUREMENTS, by S. S. Penner. Technical rept. no. 1 on Contract AF 49(638)984. Mar 61, 40p. 35 refs. AFOSR-286; AD-253 371.

DESCRIPTORS: *Temperature, Measurement, *Spectrographic analysis, Instrumentation, Test methods, Plasma physics, Shock waves.

Spectroscopic methods for temperature measurements are described with special reference to techniques that can be used if observation times are of the order of a millisecond or less. These techniques are of interest in connection with current studies on shock fronts and plasmas. Recently developed procedures for reconstructing temperature profiles in systems with axial symmetry are also described. (Author)

UCRL-9388 $2.75

Lawrence Radiation Lab., U. of California, Berkeley.
THERMAL PROPERTIES OF SOLID HYDROGEN UNDER PRESSURE, by W. H. Orttung. Rept. on Contract W-7405-eng-48. 1 Feb 61, 162p.

PB 156 472 $3.60

Massachusetts Inst. of Tech., Cambridge.
NUCLEATE BOILING BUBBLE GROWTH AND DEPARTURE, by Bogumil E. Staniszewski. Technical rept. no. 16 on Contract Nonr-1841(39). Aug 59, 31p. 10 refs. AD-227 262.

This report released for sale to the public 27 June 61.

DESCRIPTORS: *Boiling, *Bubbles, Liquids, Growth, Velocity.

The vapor bubble formation on the heating surface during pool boiling has been studied experimentally. Experiments were made at the atmospheric pressure 28 psi and 40 psi, using degassed distilled water and ethanol. The heat fluxes and heating surface temperatures have been measured simultaneously by taking high speed motion pictures of growing bubbles. The diameter time curves of the bubbles and their diameter at the departure moment were obtained in these investigations. Bubble growth rates and bubble departure sizes have been compared to existing theories. It has been found that existing growth theories do not agree very well and that the departure size of the bubble is a function of the growth velocity. (Author)

PB 155 759 $1.60

Microwave Lab., Stanford U., Calif.
IRREVERSIBLE PROCESSES IN CONSERVATIVE DYNAMICAL SYSTEMS, by P. A. Sturrock. Technical note on Electrodynamic Problems of Astrophysics, Contract AF 49(638)342. Jan 61, 12p. 16 refs. M. L. rept. no. 784; Stanford Radio Astronomy Inst. Pub. no. 13; AFOSR-246; AD-254 552.

DESCRIPTORS: *Mechanics, *Dynamics, Matrix algebra, *Numerical methods and procedures, Admittance.

A model of a conservative dynamical system with a very large number of degrees of freedom is set up in the linear approximation and discussed by the methods of classical mechanics. One may associate with an external force an admittance function (with frequency as argument); there is in general a real part to this function which represents a generalization of the dissipation process known as Landau damping. The assumption of equipartition of energy among the normal modes now leads to the fluctuation-dissipation theorem which is a generalization of Nyquist's theorem. Analysis of this system also brings out the fact that the admittance function satisfies the Kramers-Kronig relations, and that, if one considers a number of forces and currents, the resulting admittance matrix satisfies the Onsager relations. (Author)

NDA-2131-12 $0.75

Nuclear Development Corp. of America, White Plains, N. Y.
BOILING SONGS AND ASSOCIATED MECHANICAL VIBRATIONS, by H. Firstenberg. Rept. on Contract AT(30-1)-2303(IX). 30 June 60, 28p.

IDO-1662 $0.75

Phillips Petroleum Co., Idaho Falls.
MTR GAMMA HEAT GENERATION MEASUREMENTS, by L. D. Weber and C. H. Hogg. Rept. on Contract AT(10-1)-205. 5 May 61, 39p.

SC-4591(RR) $0.75

Sandia Corp., Albuquerque, N. Mex.
ANALYSIS OF PRESSURE DROP AND HEAT TRANSFER OF A PEBBLE-BED-STORAGE HEATER FOR A HYPERSONIC WIND TUNNEL, by D. E. Randall and A. Bedford. Research rept. May 61, 29p.

PB 156 471 $6.60

Stanford U., Calif.
THE INFLUENCE OF TEMPERATURE DEPENDENT PROPERTIES ON GAS FLOW HEAT TRANSFER IN CIRCULAR TUBES, by W. B. Nicoll and W. M. Kays. Technical rept. no. 43 on Contract Nonr-225(23). 1 Sep 59, 70p. 13 refs. AD-227 572.

This report released for sale to the public 27 June 61.

DESCRIPTORS: *Gas flow, *Heat transfer, *Temperature, Laminar boundary layer, Turbulent flow, *Pipes, *Cooling.

The present investigation attempts to experimentally determine the effect of large temperature differences for flow of air in a circular tube under the conditions of laminar flow heating, laminar flow cooling, and turbulent flow cooling. Experimental data are presented for laminar flow heating and cooling up to absolute temperature ratios of about 1.8, and for turbulent flow cooling for absolute temperature ratios from 1.5 to 2.7. The laminar flow heating data, despite temperature rises of as much as 1100°F, and temperature differences as high as 550°F, show negligible temperature dependent properties effects, and in fact correspond very closely to the Graetz solution (extended) if all properties are evaluated at local mixed-mean temperature. The laminar cooling data also correspond well with the Graetz solution for mean Nusselt number with respect to length, provided that properties are evaluated at the logarithmic mean temperature with respect to end temperatures and wall temperature. The turbulent cooling data show no detectible effect of temperature ratio when properties are evaluated at the logarithmic mean temperature. (Author)

PB 156 466 $9.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THE EFFICIENCY OF EXCITATION OF A SURFACE WAVE ON A DIELECTRIC CYLINDER, by James Wilbur Duncan. Doctoral thesis. Technical rept. no. 32 on Contract AF 33(616)3220. 25 May 58, 118p. 18 refs. AD-162 052

This report released for sale to the public 28 June 61.

DESCRIPTORS: *Electromagnetic waves, Excitation, *Dielectrics, Cylindrical bodies

This paper treats the excitation of a transverse magnetic surface wave on a dielectric cylinder. Specifically, the efficiency with which a circular filament of magnetic current excites the E_{01} mode on an infinite, dielectric rod is determined. The E_{01} mode is the lowest order, transverse magnetic mode which can propagate on a dielectric rod. The excitation efficiency of a source is defined as the ratio of the power converted to the surface wave mode to the total power which is delivered by the source. A very narrow, annular slot in a large metal sheet was used to approximate the magnetic current filament. The excitation efficiency of the slot was measured using Deschamps' method for calibrating a two-port waveguide junction. The measured efficiencies are in close agreement with the results predicted by the theory.

PB 155 854 $1.60

Institute of Mathematical Sciences, New York U., N. Y.
THE EXPONENTIAL SOLUTION FOR THE HOMOGENEOUS LINEAR DIFFERENTIAL EQUATION OF THE SECOND ORDER, by J. Mariani and W. Magnus. Rept. on Contract AF 49(638)229. Feb 61, 19p. Research rept. no. BR-37; AFOSR-391; AD-254 788.

DESCRIPTORS: *Differential equations, *Sound, *Propagation, *Electromagnetic waves, Mathematical analysis, Wave transmission.

A linear second order differential equation may be considered as a 2 x 2 system of first order equations. The question is whether the solutions of this system can be written in the form exp omega where omega is a 2 x 2 matrix. A motivation for the problem is given, based on the question of defining lump constants for an inhomogeneous layer. Conditions necessary for the existence of omega are given for a variety of circumstances. (Author)

PB 161 585 $7.00

National Bureau of Standards, Boulder, Colo.
BIBLIOGRAPHY ON IONOSPHERIC PROPAGATION OF RADIO WAVES (1923-1960) by Wilhelm Nupen. Oct 60, 480p. 1404 refs. Technical note no. 84.

DESCRIPTORS: *Radio waves, *Ionospheric propagation, Bibliography, Propagation

This bibliography comprises a non-exhaustive compilation of over 1400 references to the world's literature on the ionosphere with special emphasis on its effect on reflection, refraction or propagation of electromagnetic waves. The frequencies involved are usually in the low frequency or long wave bands in contrast to those (UHF, VHF and SHF) involved in tropospheric propagation investigations although the pulsed technique at vertical or slant incidence makes use of a wide range of frequencies. Several distinct fields of ionospheric propagation have been purposely omitted in order to keep the volume of material down to manageable proportions. There are: Meteor or meteor trail propagation; Radio reflection from auroras; Radioastronomy.

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

PB 156 347 $2.60

Kenyon Coll., Gambier, Ohio.
RATE OF SPEAKING (RESPONSES TO HEARD STIMULI) II: REPETITIONS OF PHRASES CONTAINING LOGICAL AND ILLOGICAL PAUSES. III. RELATIONSHIP BETWEEN ORIGINAL AND REPEATED PHRASES FOR SPEAKERS OF VARIOUS NORMAL RATES, by Charles Lightfoot and John W. Black. Rept. nos. 2, 3 on Contract N7onr-411, T. O. 1. 10 June 48, 21p. 2 refs. SDC rept. 411-1-3; ATI-26 859.

This report released for sale to the public 26 June 61.

DESCRIPTORS: *Speech, Intelligibility, Reaction (Psychology), Voice communication systems, Speech transmission, Training

PB 171 870 $0.50

Metals and Ceramics Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
THE APPLICATION OF COMPUTER TECHNIQUES TO PREFERRED ORIENTATION STUDIES, by J. R. Holland. Rept. for Jan-June 60, on Metallic Materials. Dec 60, 19p. 3 refs. WADD Technical note 60-242.

DESCRIPTORS: *X-ray diffraction analysis, Metals, *Data processing systems, Methods, Programming, Computers, Sheets, X-rays, Intensity, Measurement.

A method has been devised and is currently being used to plot normalized pole figures by computer techniques. As the pole distribution traces, i.e., intensity of the diffracted x-ray beam, versus angular position of the specimen are not an acceptable input for the computer, the data required from such traces are entered onto punch cards. Corrections for defocusing effects may be readily made as the data are transferred from the Brown recorder traces to punch cards. It is possible to program other correction factors into the computer operations, providing that these correction factors or curves can be established accurately. The computer translates angular position of the specimen into rectilinear co-ordinates which are an identical representation of stereographic co-ordinates. This computer method has been used in conjunction with the Schulz reflection technique, but modification of the computer program permits its use with other quantitative x-ray techniques for determining preferred orientation. The feasibility of using computer techniques to plot inverse pole figures has been considered. (Author)

Documentation

PB 156 941 $10.10

Bureau of Applied Social Research, Columbia U., New York.
REVIEW OF STUDIES IN THE FLOW OF INFORMATION AMONG SCIENTISTS. VOLUME I: TEXT. VOLUME II: TABLES, by Herbert Menzel, Louis Lieberman, and Joan Dulchin. Sep 60, 122p. 202 refs.

DESCRIPTORS: *Scientific reports, *Documentation, Effectiveness

Contents:
Categories and methodology of the tabulated findings
Findings not reproduced in this review
Inferences from multiple data
Some neglected approaches
Tables: notation and symbols; exposure tables; function tables; performance tables

PB 155 470 $21.00

Harvard U., Cambridge, Mass.
SYNTACTIC ANALYSIS IN AUTOMATIC TRANSLATION, by Murray Elliot Sherry. Doctorial thesis. Jan 61, 360p. 35 refs. Formerly rept. no. NSF-5; AFCRL-108; AD-253 273.

DESCRIPTORS: *Machine translation, *Language, Vocabulary, *Dictionaries, Analysis, Digital computers Data processing systems.

A method for the syntactic analysis of Russian sentences, applied to automatic translation, is divided into a morphological word-by-word phase and a syntactical sentence-by-sentence phase. An idealized canonical stem dictionary is presented, and its significant lexicographic properties are pointed out. This idealized dictionary then serves as a basis for evaluating the actual Harvard Automatic Dictionary. Aspects of morphological analysis of the Russian language and a series of programs written to carry it out are described. To explain the practical problems encountered in an experimental syntactic analysis program, of which a detailed description is given, a new model of natural language is introduced. (Author)

PB 171 833 $0.50

Lincoln Lab., Mass. Inst. of Tech., Lexington.
AN EXPERIMENTAL COMMUNICATION CENTER FOR SCIENTIFIC AND TECHNICAL INFORMATION, by

M. M. Kessler. Rept. on Contract AF 19(604)5200. 31 Mar 60, 20p. 4G-0002; AD-254 656.

DESCRIPTORS: *Documentation, Literature, Communication systems, Scientific reports, *Data processing systems, Library science, *Scientific research, Design

A discussion is presented of the problems of scientific communication. The report stresses that the evaluation of new ideas and components must be made in a system environment and not in terms of parameters unique to each component. A distinction is made between scientific message units and their mode of propagation. The message units (scientific talks and papers) are considered adequate for their functions, but they are encountering increasing losses and delays in propagation. The analysis indicates that the most critical item in need of research and invention is an indexing or addressing scheme that will direct papers to readers. Valid directional indexing should be sought in the operational history of the author and the intended reader. A communication system for experimental purposes is briefly outlined. The three principal channels of the system are (1) Non-interrogated broadcasting, (2) Interrogated point to point transmission, and (3) Non-interrogated point to point transmission. It is stressed that the critical need at this point is for a deeper understanding of the logic of scientific information and its flow habits. It is recommended that a pilot system of scientific communication be established to serve as a test bed for components development and systems research. (Author)

PB 171 869 $2.00

McGraw-Hill Book Co., Inc., New York.
MATERIALS INFORMATION CENTERS, by Katharine A. Winter and Irving Lopatin. Rept. for July-Oct 60 on Materials Applications, Contract AF 33(616)6288. Feb 61, 74p. WADD Technical note 60-246.

DESCRIPTORS: *Information theory, Data storage systems, Communication systems, *Documentation, *Scientific reports, *Scientific organizations, Reports, Materials

This Technical Note contains a listing of all known organizations or agencies which may be designated as a materials information center on the basis of their activities concerned with the collection and dissemination in some manner, of information on a class, group, or type of material, or materials. The purpose of this Technical Note is to provide interested personnel of the Department of Defense, its contractors, and materials suppliers with a means of locating and obtaining information pertinent to their specific area of interest.ver) (Author)

PB 171 320 $1.25, $10.00/year

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS. July 61.

DESCRIPTORS: Naval research, Scientific research

Contents:
Articles:
The Quasi-Complementary Symmetry Power Amplifier, by A. C. Macpherson
Neutron Diffraction Study of Pile-Irradiated Fe_3O_4, by G. A. Fergusion, Jr., and E. I. Salkovitz
Scientific program:
Applications Research: Naval data-handling system circuits. Shipboard satellite position display
Atmosphere and Astrophysics: Atmospheric attenuation coefficients in the visible and infrared regions
Chemistry: Solubilization of methanol by soap micelles in toluene as measured by gas chromatography. Comparison of potassium hydroxide, cesium hydroxide, and rubidium hydroxide as electrolytes for the silver oxide-zinc alkaline primary cell. On the present status of chemical research in atmosphere purification and control on nuclear-powered submarines
Electricity: Transistorized ring-type pulse generator
Metallurgy and Ceramics: Analysis of complex iron-base alloys (containing, Nb, Ti, Ni, Si, and Al). Structure of $NbZn_2$. Recalescence of supercooled liquids on freezing. Effect of irradiation temperatures on neutron-induced changes in notch ductility of pressure-vessel steels. Removal of interstitial impurities from Nb by Zn-Nb compounds. Progress report on protection of refractory metals for high-temperature service. Rhenium metal processing. Effect of nonadherent corrosion products on localized attack
Nuclear and Atomic Physics: Modification of reactor fuel elements to reduce fast neutron flux
Optics: LASER properties and performance
Radio: Breakaway digital modular devices to aid the development of switching subsystems. Synthesis of an antenna with a Gaussian-shaped radiation pattern. A highly accurate square-law recorder. A portable thermistor-bridge gas leak detector. Experimental electron tube contains field-emission microscope and Alpert-type ionization gauge. A 10:1 frequency multiplier with 10:1 input frequency range and automatic fine tuning
Solid State Physics: Electronic equilibrium in free-air chambers and a proposed new design
Sound: Drop outs in magnetic tape systems

A D INDEX

AD No.	Div.
257 602	22
257 603	18
257 604	30
257 605	3
257 606	28
257 607	30
257 608	18
257 609	28
257 613	2
257 615	29
257 616	10
257 618	9
257 619	7
257 620	10
257 621	30
257 622	8
257 623	26
257 624	6
257 625	6
257 626	6
257 627	30
257 628	7
257 629	3
257 640	15
257 641	17
257 642	1
257 643	12
257 649	33
257 650	2
257 651	2
257 652	16
257 653	26
257 654	17
257 655	30
257 656	25
257 657	25
257 658	25
257 659	30
257 660	19
257 661	25
257 662	2
257 663	26
257 664	17
257 665	26
257 666	26
257 667	17
257 668	25
257 669	26
257 670	26
257 671	17
257 672	17
257 673	17
257 674	17
257 675	2
257 676	2
257 677	25
257 679	26
257 680	17
257 681	1
257 682	22
257 683	14
257 684	4
257 685	20
257 686	26
257 687	26
257 688	25
257 689	12
257 690	9
257 691	25
257 692	26
257 693	25
257 694	17
257 695	17
257 696	8
257 697	25
257 698	4
257 699	30
257 700	17
257 701	1
257 702	2
257 704	20
257 707	14
257 708	20
257 710	25
257 711	8
257 712	16
257 713	25
257 714	1
257 715	1
257 716	17
257 717	15
257 719	28
257 720	22
257 721	16
257 722	26
257 723	27
257 726	30
257 727	17
257 728	9
257 729	25
257 730	25
257 731	14
257 732	14
257 733	26
257 734	9
257 735	17
257 736	8
257 737	16
257 738	5
257 739	17
257 740	6
257 741	6
257 742	10
257 743	25
257 744	19
257 745	19
257 746	26
257 747	4
257 748	8
257 756	9
257 757	9
257 758	26
257 761	7
257 762	16
257 763	8
257 764	25
257 771	25
257 772	15
257 773	2
257 774	30
257 775	12
257 778	30
257 780	7
257 781	8
257 782	15
257 788	7
257 789	14
257 790	16
257 791	16
257 792	16
257 793	25
257 794	16
257 795	7
257 796	25
257 797	12
257 798	12
257 799	9
257 800	9
257 801	12
257 802	12
257 803	12
257 804	12
257 805	22
257 807	9
257 808	9
257 809	8
257 811	8
257 812	17
257 813	26
257 815	25
257 816	15
257 817	10
257 818	25
257 820	2
257 821	2
257 822	25
257 823	14
257 824	9
257 825	8
257 826	2
257 827	5
257 828	7
257 829	8
257 830	15
257 831	2
257 832	18
257 834	9
257 835	1
257 836	17
257 837	1
257 838	22
257 839	30
257 840	12
257 841	2
257 842	2
257 843	8
257 851	9
257 852	9
257 853	9
257 854	9
257 855	7
257 856	9
257 857	9
257 858	9
257 860	17
257 861	27
257 862	9
257 863	4
257 864	25
257 865	17
257 866	17
257 867	14
257 868	5
257 869	15
257 870	28
257 872	33
257 875	19
257 879	6
257 880	25
257 881	25
257 882	1
257 883	28
257 885	2
257 886	30
257 888	2
257 889	20
257 890	9
257 891	5
257 892	25
257 893	25
257 894	4
257 895	28
257 896	1
257 897	25
257 898	7
257 900	17
257 901	17
257 902	17
257 903	17
257 904	17
257 905	2
257 906	10
257 907	10
257 908	7
257 909	4
257 910	4
257 911	12
257 912	25
257 913	2
257 914	30
257 915	26
257 916	4
257 917	14
257 918	20
257 919	30
257 920	10
257 921	4
257 922	16
257 923	27
257 924	4
257 925	23
257 926	17
257 927	6
257 928	20
257 929	25
257 930	13
257 931	21
257 932	25
257 933	8
257 934	25
257 936	2
257 937	18
257 938	12
257 939	32
257 940	26
257 941	8
257 942	8
257 943	8
257 944	6
257 945	6
257 946	30
257 947	8
257 948	8
257 949	5
257 950	17
257 960	14
257 961	33
257 963	17
257 964	32
257 965	5
257 966	25
257 967	17
257 968	25
257 969	8
257 971	4
257 972	8
257 973	32
257 974	30
257 975	4
257 976	27
257 977	7
257 981	15
257 982	2
257 983	5
257 984	8
257 985	8
257 986	8
257 987	30
257 988	1
257 989	1
257 991	1
257 992	1
257 993	8
257 994	25
257 995	17
257 996	16
257 997	8
257 998	30
257 999	8
258 000	12
258 001	22
258 002	1
258 003	29
258 004	6
258 008	6
258 009	9

AD No.	Div.
258 010	30
258 011	20
258 012	22
258 017	30
258 018	20
258 019	5
258 020	12
258 021	20
258 023	25
258 024	17
258 025	8
258 026	26
258 027	23
258 030	8
258 035	16
258 036	8
258 037	8
258 038	25
258 039	25
258 040	17
258 041	17
258 042	14
258 047	2
258 049	2
258 050	10
258 052	27
258 054	26
258 055	8
258 058	15
258 069	12
258 070	14
258 071	14
258 072	14
258 073	14
258 074	2
258 075	7
258 076	8
258 077	8
258 078	7
258 079	9
258 080	25
258 081	25
258 082	20
258 085	2
258 086	1
258 087	25
258 088	29
258 089	17
258 090	25
258 092	14
258 093	25

AD No.	Div.
258 094	17
258 100	16
258 101	16
258 111	25
258 122	2
258 131	7
258 132	25
258 133	25
258 134	2
258 135	8
258 136	30
258 137	26
258 138	8
258 140	16
258 141	22
258 142	26
258 143	20
258 144	25
258 145	8
258 146	3
258 147	25
258 148	16
258 149	24
258 161	9
258 180	14
258 193	9
258 194	9
258 195	26
258 196	6
258 197	4
258 198	25
258 199	16
258 200	8
258 201	22
258 202	7
258 203	25
258 204	25
258 205	22
258 206	6
258 207	25
258 208	20
258 209	25
258 210	20
258 211	25
258 212	17
258 213	16
258 214	15
258 215	1
258 216	25
258 217	4
258 218	25

AD No.	Div.
258 219	8
258 220	25
258 221	19
258 222	25
258 223	9
258 224	28
258 225	8
258 226	9
258 227	15
258 228	8
258 229	10
258 230	8
258 231	10
258 232	9
258 233	15
258 234	15
258 235	15
258 236	15
258 237	15
258 238	8
258 239	31
258 240	15
258 241	17
258 242	25
258 243	9
258 244	9
258 245	26
258 246	13
258 247	20
258 248	4
258 249	15
258 250	15
258 251	9
258 252	4
258 253	20
258 254	25
258 255	20
258 256	25
258 257	14
258 258	2
258 259	25
258 260	2
258 261	8
258 262	13
258 263	5
258 264	8
258 265	17
258 266	9
258 267	9
258 268	9

AD No.	Div.
258 269	2
258 270	20
258 271	20
258 272	20
258 273	20
258 284	9
258 295	14
258 296	29
258 299	12
258 300	26
258 301	30
258 302	24
258 303	30
258 304	23
258 305	27
258 306	17
258 307	15
258 308	2
258 317	1
258 318	8
258 319	25
258 320	5
258 321	13
258 322	25
258 323	25
258 324	20
258 325	8
258 326	10
258 327	22
258 328	6
258 329	7
258 330	22
258 331	8
258 332	10
258 333	29
258 334	9
258 335	15
258 336	3
258 337	25
258 338	8
258 339	7
258 340	25
258 341	16
258 342	8
258 343	9
258 344	9
258 345	6
258 346	2
258 347	25
258 348	9
258 349	28

Div.

2
20
20
20
20
9
14
29
12
26
30
24
30
23
27
17
15
2
1
8
25
5
13
25
25
20
8
10
22
6
7
22
8
10
29
9
15
3
25
8
7
25
16
8
9
9
6
2
25
9
28

NUMBER INDEX

Number	Page
ACR-55	S-1
AD-2314	S-1
AD-3080	S-46
AD-9182	S-46
AD-34 897	S-32
AD-54 772	S-52
AD-62 333	S-35
AD-64 266	S-38
AD-69 478	S-8
AD-69 501	S-8
AD-69 654	S-16
AD-89 648	S-13
AD-89 681	S-14
AD-120 524	S-14
AD-123 123	S-8
AD-127 454	S-22
AD-127 455	S-21
AD-128 131	S-9
AD-128 528	S-54
AD-131 307	S-24
AD-138 309	S-33
AD-147 215	S-23
AD-156 161	S-23
AD-162 052	S-61
AD-200 362	S-13
AD-200 363	S-13
AD-203 592	S-50
AD-211 181	S-27
AD-211 656	S-5
AD-212 714	S-45
AD-215 614	S-25
AD-219 895	S-36
AD-225 158	S 25
AD-226 274	S-11
AD-226 311	S-12
AD-227 262	S-60
AD-227 572	S-61
AD-228 875	S-59
AD-229 604	S-25
AD-230 931	S-16
AD-231 082	S-53
AD-233 534	S-11
AD-233 669	S-3
AD-234 531	S-51
AD-234 712	S-25
AD-234 982	S-56
AD-235 943	S-26
AD-237 674	S-49
AD-237 889	S-43
AD-239 385	S-2
AD-239 386	S-2
AD-239 888	S-11
AD-241 006	S-26
AD-241 080	S-12
AD-241 520	S-55
AD-241 646	S-24
AD-242 404	S-9
AD-242 405	S-1
AD-243 197	S-5
AD-243 886	S-10
AD-244 314	S-2
AD-244 690	S-46
AD-244 938	S-46
AD-245 293	S-27
AD-246 045	S-26
AD-246 583	S-4
AD-247 184	S-50
AD-247 298	S-34
AD-247 591	S-40
AD-248 889	S-13
AD-250 324	S-32
AD-250 562	S-33
AD-251 052L	S-10
AD-251 153	S-27
AD-251 168	S-33
AD-251 199	S-9
AD-251 235	S-54
AD-251 236	S-44
AD-251 238	S-3
AD-251 432	S-24
AD-251 449	S-53
AD-251 479	S-57
AD-251 573	S-58
AD-251 616	S-43
AD-251 634	S-37
AD-251 907	S-42
AD-252 038	S-37
AD-252 054	S-45
AD-252 056	S-34
AD-252 068	S-42
AD-252 160	S-32
AD-252 224	S-56
AD-252 340	S-36
AD-252 344	S-7
AD-252 357	S-37
AD-252 393	S-58
AD-252 394	S-51
AD-252 395	S-23
AD-252 488	S-33
AD-252 636	S-57
AD-252 680	S-28
AD-252 737	S-22
AD-252 814	S-33
AD-252 915	S-24
AD-252 942	S-35
AD-252 982	S-9
AD-253 053	S-40
AD-253 129	S-37
AD-253 138	S-9
AD-253 175	S-22
AD-253 200	S-38
AD-253 273	S-62
AD-253 280	S-44
AD-253 292	S-35
AD-253 341	S-59
AD-253 342	S-59
AD-253 343	S-45
AD-253 344	S-59
AD-253 350	S-36
AD-253 363	S-1
AD-253 371	S-60
AD-253 396	S-55
AD-253 432	S-15
AD-253 452	S-52
AD-253 461	S-22
AD-253 543	S-35
AD-253 594	S-53
AD-253 622	S-56
AD-253 674	S-55
AD-253 745	S-3
AD-253 804	S-6
AD-253 821, pt. 2	S-7
AD-253 825	S-7
AD-253 850	S-58
AD-253 964	S-1
AD-254 030	S-57
AD-254 031	S-57
AD-254 036	S-56
AD-254 124	S-54
AD-254 140	S-58
AD-254 141	S-55
AD-254 242	S-54
AD-254 260	S-14
AD-254 278	S-10
AD-254 280	S-52
AD-254 297	S-35
AD-254 304	S-6
AD-254 326	S-6
AD-254 328	S-34
AD-254 352	S-36
AD-254 360	S-8
AD-254 361	S-8
AD-254 366	S-34
AD-254 382	S-35
AD-254 455	S-38
AD-254 457	S-34
AD-254 500	S-7
AD-254 528	S-37
AD-254 552	S-60
AD-254 656	S-62
AD-254 659	S-12
AD-254 681	S-60
AD-254 688	S-54
AD-254 693	S-22
AD-254 761	S-12
AD-254 769	S-59
AD-254 788	S-61
AD-254 810	S-3
AD-254 811	S-2
AD-254 813	S-30
AD-254 844	S-7
AD-254 860	S-49
AD-254 876	S-38
AD-254 909	S-34
AD-254 922	S-41
AD-254 941	S-41
AD-254 956	S-55
AD-254 957	S-58
AD-254 978	S-53
AD-255 096 repriced	S-6
AD-255 278 repriced	S-31
AD-255 456 repriced	S-39
AD-255 659 repriced	S-39
AD-255 755 repriced	S-44
AD-255 769	S-30
AD-256 206 repriced	S-39
AD-256 595	S-27
AD-256 596	S-32
AD-256 597	S-42
AD-256 701 repriced	S-28
AD-256 702 repriced	S-28
AD-256 748 repriced	S-29
AD-256 767 repriced	S-41
AD-256 881 repriced	S-28
AD-256 882 repriced	S-29
AD-256 884 repriced	S-29
AFBMD-9-5333	S-39
AFBMD-TR-60-36	S-57
AFCCDD-TN-61-1000	S-56
AFCRL-4	S-54
AFCRL-69	S-49
AFCRL-108	S-62
AFCRL-208	S-53
AFCRL-266	S-10
AFCRL-TR-60-195	S-52
AFOSR-15	S-41
AFOSR-73	S-3
AFOSR-167	S-35
AFOSR-168	S-7
AFOSR-169	S-59
AFOSR-170	S-59
AFOSR-171	S-45
AFOSR-174	S-45
AFOSR-179	S-34
AFOSR-180	S-33
AFOSR-200	S-22
AFOSR-201	S-22
AFOSR-202	S-9
AFOSR-212	S-37
AFOSR-217	S-53
AFOSR-218	S-33
AFOSR-219	S-38
AFOSR-220	S-6
AFOSR-224	S-44
AFOSR-225	S-54
AFOSR-227	S-59
AFOSR-229	S-37
AFOSR-230	S-34
AFOSR-235	S-3
AFOSR-241	S-43
AFOSR-242	S-6
AFOSR-246	S-60
AFOSR-265	S-24
AFOSR-271	S-42
AFOSR-270	S-22
AFOSR-275	S-36
AFOSR-282	S-42
AFOSR-283	S-52
AFOSR-284	S-55
AFOSR-285	S-22
AFOSR-286	S-60
AFOSR-287	S-3
AFOSR-290	S-53
AFOSR-291	S-35
AFOSR-293	S-9
AFOSR-295	S-1
AFOSR-299	S-2
AFOSR-302	S-36
AFOSR-306	S-58
AFOSR-308	S-55
AFOSR-316	S-35
AFOSR-319	S-58
AFOSR-320	S-51
AFOSR-321	S-23
AFOSR-322	S-35
AFOSR-334	S-9
AFOSR-336	S-37
AFOSR-355	S-7
AFOSR-362	S-28
AFOSR-363	S-34
AFOSR-364	S-37
AFOSR-382	S-56
AFOSR-383	S-54
AFOSR-385	S-44
AFOSR-391	S-61
AFOSR-397	S-7
AFOSR-399	S-54
AFOSR-400	S-37
AFOSR-416	S-55
AFOSR-423	S-57
AFOSR-425	S-38
AFOSR-431	S-58
AFOSR-432	S-33
AFOSR-434	S-57
AFOSR-440	S-38
AFOSR-449	S-36
AFOSR-450	S-36
AFOSR-451	S-10
AFOSR-454	S-1
AFOSR-460	S-58
AFOSR-472	S-56
AFOSR-479	S-57
AFOSR-509	S-55
AFOSR-515	S-34
AFOSR-520	S-59
AFOSR-533	S-7
AFOSR-542	S-58
AFOSR-TN-60-1016	S-8
AFOSR-TN-60-1017	S-8
AFOSR-TN-60-1210	S-7
AFOSR-TN-60-1348	S-6
AFOSR-TN-60-1484	S-14
AFOSR-TN-60-1489	S-34
AFN-8015	S-47
ANL-6078	S-47
ANL-6330	S-39
ANL-6374	S-47
APEX-587	S-13
ARF-K159	S-16
ARL-4	S-60
ARPA Order-44-59	S-25
ARPA Order-44-59	S-26
ARPA Order-44-61	S-26
	S-27
ASRDL-2162	S-50
ASRL-TR-76-5	S-35
ATI-26 859	S-62
ATI-128 732	S-16
ATI-155 773	S-51
ATI-209 405	S-10
Avco RR-69	S-57
AWS TR-150	S-12
AWS TR-151	S-12
BM-3769	S-25
BMI-1516	S-31
BN-228	S-37
BN-229	S-36
BN-230	S-58
BN-232	S-37
BN-233	S-28
BN-234	S-57
BN-235	S-58
BN-236	S-57
BNL-631	S-43
BNL-666	S-48
BNL-672	S-48
BR-NYU-37	S-61
BSSR RR-339-1	S-1
BSSR RR-339-2	S-1
Case Pub-1041	S-33
CCL-103	S-30
CompLab NSF-5, superseded	S-62
CRREL-BR-72	S-11
CRREL-RR-46	S-11
CRREL-RR-51	S-11
CRREL-RR-69	S-11
CRREL-RR-71	S-11
CRREL-RR-72	S-11
CRREL-TR-53	S-15
CRREL-TR-68	S-15
CTR;21 suppl.	S-32
CTR-322 suppl.	S-32
CTR-345 suppl.	S-32
DACL-100	S-33
DDI-108	S-13
DDI-109	S-13
DMIC-151	S-41
DMIC-M-101	S-39
DMIC-M-102	S-31
DMIC-M-104	S-39
DMIC-M-105	S-39
DOFL TR-832	S-49
DP-532	S-48
DP-571	S-5
DP-577	S-45
DP-582	S-15

Number	Page
DP-588	S-32
DP-605	S-47
DSR-5-7817	S-40
EES-010 058C	S-15
EES-010 058E	S-74
EOS-390, v. 3	S-28
EOS-390, v. 4	S-28
EOS-390, v. 7	S-28
EOS-390, v. 8	S-29
EOS-390, v. 9	S-29
EOS-390, v. 10	S-29
FDRG-60-6	S-37
FZK-9-147, v. 1	S-43
GA-1378	S-47
GA-1640	S-47
GA-1774	S-47
GA-2065	S-47
GAMD-1769	S-40
GEAP-3489	S-50
GEAP-3492	S-51
GEAP-3548	S-43
GLM ER-10470-6	S-27
Grant DA-ORD-3, IR-2	S-34
Grant DA-ORD-43, TR-6	S-32
Grant NSF-G-12142	S-22
HE-150-186	S-37
HUMRRO SR-1	S-1
HW-61236(Suppl. 3)	S-47
HW-62902	S-14
HW-66715	S-14
HW-68380	S-6
IDO-1662	S-61
IDO-14306	S-42
IDO-14521	S-48
IDO-14547	S-5
IDO-16611	S-50
IDO-16640	S-48
IDO-16665	S-48
IER-60-336	S-22
IER-60-338	S-22
IER-60-341	S-22
IER-132-3	S-37
IRIG	S-27
IRIG-104-60	S-27
IS-190	S-14
K-1476	S-5
K-1479	S-48
KAPL-2145	S-51
KAPL-2149	S-7
LA-2531	S-31
LA-2535	S-40
LAMS-2491	S-53
LIR TR-152	S-55
LL 4G-0002	S-62
Lock NR-73	S-53
MH-35900	S-55
MIL-STD-206	S-30
ML-784	S-60
ML(UM)60 241	S-10
ML(UM)8942-4	S-10
MLM-1101 Tr.	S-5
MLM-CF-57-10-31	S-23
MND-M-1814	S-47
MSEE-60-12	S-56
MUP TR-205	S-45
MUP TR-207	S-53
MURA-477	S-45
NAA-SR-4542	S-43
NAA-SR-4989	S-47
NAA-SR-5904	S-43
NAA-SR-6087	S-6
NAA-SR-6094	S-6
NARF-60-8T, v. 1	S-43
NAS-NS-3032	S-43
NAS-NS-3033	S-45
NAS-NS-3034	S-45
NAS-NS-3035	S-43
NAS-NS-3036	S-45
NAVEXOS P-560	S-10
NAVTRADEVCEN-411-1-3	S-62
NAVWEPS-6656	S-51
NAVWEPS-7617	S-40
NAVWEPS SSL-AE-06	S-19
NAVWEPS SSL-AE-11	S-17
NAVWEPS SSL-AF-01	S-19
NAVWEPS SSL-AF-03	S-21
NAVWEPS SSL-AF-05	S-18
NAVWEPS SSL-AF-06, rev. 1	S-17
NAVWEPS SSL-AF-12, superseded	S-21
NAVWEPS SSL-AF-13, rev. 1	S-18
NAVWEPS SSL-AF-14	S-19
NAVWEPS SSL-AF-16	S-18
NAVWEPS SSL-AF-19	S-20
NAVWEPS SSL-AG-01	S-19
NAVWEPS SSL-AG-05	S-20
NAVWEPS SSL-AG-07	S-18
NAVWEPS SSL-AG-08	S-19
NAVWEPS SSL-AG-09	S-20
NAVWEPS SSL-AG-10	S-21
NAVWEPS SSL-AG-11	S-19
NAVWEPS SSL-AG-13	S-21
NAVWEPS SSL-AG-14	S-18
NAVWEPS SSL-AG-15	S-18
NAVWEPS SSL-AG-20	S-19
NAVWEPS SSL-AG-23 superseded	S-21
NAVWEPS SSL-AG-24	S-18
NAVWEPS SSL-AG-33 superseded	S-18
NAVWEPS SSL-AR-01	S-17
NAVWEPS SSL-AS-03	S-20
NAVWEPS SSL-AW-06	S-17
NAVWEPS SSL-BC-06	S-17
NAVWEPS SSL-BZ-01	S-20
NAVWEPS SSL-HV-01	S-21
NAVWEPS SSL-HV-03	S-21
NAVWEPS SSL-NF-01	S-39
NAVWEPS SSL-TDO-D-5	S-17
NAVWEPS SSL-TDO-D-9	S-20
NAVWEPS SSL-TDO-D-11	S-17
NAVWEPS SSL-TDO-D-12	S-17
NAVWEPS SSL-TDO-D-12	S-17
NAVWEPS SSL-TDO-D-15	S-20
NAVWEPS SSL-TDO-D-21	S-20
NAVWEPS SSL-TDO-D-26	S-53
NAVWEPS SSL-TDO-D-27	S-20
NAVWEPS SSL-TDO-D-32	S-39
NBS TN-81	S-49
NBS TN-84	S-61
NCEL R-126	S-15
NDA-2131-12	S-61
NDA-2131-16	S-48
NM 001 110 100.39	S-4
NOPI MAT-33	S-29
NOPI MAT-41	S-29
NOTS TP-2616	S-40
NRL-5603	S-41
NSL-447	S-14
NWL-1374	S-35
NYO-7949	S-10
NYO-9155	S-14
NYO-9204	S-4
NYO-9374	S-44
OORR-1913:3-M	S-33
OORR-1935:2-E	S-40
OORR-2025:6-M	S-32
OORR-2379:(6-7)	S-32
OORR-2379:2 correction	S-32
OORR-2775:1-M	S-34
ORNL-2855	S-5
ORNL-3012	S-5
ORNL-3019	S-5
ORNL-3092	S-5
ORNL-3102	S-48
ORNL-3104	S-48
ORNL-3108	S-56
ORNL-3113	S-49
ORNL-3127	S-45
OTS CTR-323, suppl.	S-41
OTS SB-455	S-3
OTS SB-457	S-41
OTS SB-458	S-41
OTS SB-459	S-32
PA-TR-1838	S-27
PB 150 010	S-12
PB 150 182 canceled	S-62
PB 150 193	S-24
PB 150 210	S-55
PB 150 225	S-9
PB 150 233	S-1
PB 150 885	S-10
PB 150 947	S-2
PB 151 110	S-41
PB 152 983	S-56
PB 153 962	S-51
PB 153 977	S-60
PB 154 142	S-10
PB 154 170	S-8
PB 154 171	S-8
PB 154 173	S-8
PB 154 174	S-9
PB 154 180	S-46
PB 154 187	S-46
PB 154 714	S-37
PB 154 731	S-33
PB 154 734	S-9
PB 154 790	S-33
PB 154 791	S-40
PB 154 892	S-34
PB 154 796	S-32
PB 154 829	S-53
PB 154 830	S-34
PB 154 909	S-43
PB 154 915 canceled	S-57
PB 154 917	S-37
PB 154 927	S-24
PB 154 931	S-45
PB 154 932	S-58
PB 154 963	S-23
PB 154 974	S-16
PB 154 982	S-42
PB 155 041	S-42
PB 155 057	S-6
PB 155 108	S-36
PB 155 135	S-7
PB 155 136	S-9
PB 155 195	S-54
PB 155 198	S-6
PB 155 211	S-58
PB 155 212	S-51
PB 155 213	S-23
PB 155 277	S-28
PB 155 281	S-37
PB 155 287	S-57
PB 155 289	S-35
PB 155 300	S-24
PB 155 304	S-9
PB 155 308	S-33
PB 155 316	S-1
PB 155 326 canceled	S-50
PB 155 339 canceled	S-40
PB 155 340	S-35
PB 155 360	S-22
PB 155 363	S-37
PB 155 387 canceled	S-15
PB 155 420	S-59
PB 155 421	S-45
PB 155 423	S-44
PB 155 424	S-59
PB 155 425	S-36
PB 155 426	S-44
PB 155 427	S-59
PB 155 441	S-60
PB 155 452	S-22
PB 155 456	S-53
PB 155 460	S-1
PB 155 465	S-56
PB 155 470	S-62
PB 155 473	S-52
PB 155 480	S-38
PB 155 483	S-55
PB 155 485	S-22
PB 155 491	S-33
PB 155 509	S-32
PB 155 527	S-3
PB 155 528	S-58
PB 155 529	S-55
PB 155 536	S-3
PB 155 537	S-35
PB 155 557	S-7
PB 155 604	S-57
PB 155 605	S-57
PB 155 619	S-44
PB 155 623	S-7
PB 155 632	S-56
PB 155 644	S-54
PB 155 646	S-52
PB 155 661	S-58
PB 155 662	S-55
PB 155 664 canceled	S-54
PB 155 689	S-8
PB 155 690	S-8
PB 155 691	S-6
PB 155 692	S-36
PB 155 693	S-36
PB 155 694	S-10
PB 155 697	S-7
PB 155 698	S-35
PB 155 700	S-34
PB 155 701	S-35
PB 155 703	S-34
PB 155 708	S-3
PB 155 755	S-34
PB 155 759	S-60
PB 155 779canceled	S-30
PB 155 780canceled	S-30
PB 155 783	S-53
PB 155 784	S-55
PB 155 787	S-38
PB 155 788 canceled	S-6
PB 155 790 canceled	S-62
PB 155 797	S-10
PB 155 799	S-54
PB 155 803	S-37
PB 155 806	S-22
PB 155 808	S-12
PB 155 809	S-12
PB 155 810	S-14
PB 155 812	S-2
PB 155 813	S-3
PB 155 833	S-7
PB 155 852 canceled	S-49
PB 155 854	S-61
PB 155 863	S-59
PB 155 866	S-58
PB 155 867	S-34
PB 155 869	S-38
PB 155 880	S-41
PB 156 309	S-14
PB 156 317	S-29
PB 156 318	S-29
PB 156 319	S-4
PB 156 320	S-52
PB 156 322	S-32
PB 156 323	S-23
PB 156 324	S-15
PB 156 325	S-74
PB 156 326	S-4
PB 156 327	S-39
PB 156 328	S-16
PB 156 329	S-56
PB 156 330	S-51
PB 156 338-1	S-13
PB 156 338-2	S-14
PB 156 346	S-35
PB 156 347	S-62
PB 156 348	S-40
PB 156 349	S-30
PB 156 350	S-1
PB 156 351	S-38
PB 156 463	S-27
PB 156 464	S-21
PB 156 465	S-22
PB 156 466	S-61
PB 156 467	S-33
PB 156 468	S-54
PB 156 469	S-13
PB 156 470	S-13
PB 156 471	S-61
PB 156 472	S-60
PB 156 473	S-59
PB 156 477	S-10
PB 156 478	S-33
PB 156 540	S-49
PB 156 541	S-23
PB 156 542	S-24
PB 156 575	S-2
PB 156 576	S-2
PB 156 577	S-53
PB 156 578	S-24
PB 156 579	S-50
PB 156 580	S-5
PB 156 581	S-15
PB 156 582	S-15
PB 156 583	S-11
PB 156 584	S-11
PB 156 585	S-11
PB 156 586	S-11
PB 156 587	S-11
PB 156 638	S-45
PB 156 639	S-36
PB 156 640	S-13
PB 156 641	S-51
PB 156 642	S-12
PB 156 643	S-31
PB 156 644	S-5
PB 156 645	S-46
PB 156 647	S-46
PB 156 648	S-40
PB 156 649	S-43
PB 156 650	S-4
PB 156 651	S-27
PB 156 655	S-16
PB 156 932	S-25
PB 156 933	S-25
PB 156 934	S-25
PB 156 935	S-25
PB 156 936	S-26
PB 156 937	S-26
PB 156 938	S-26
PB 156 939	S-27
PB 156 940	S-27

Number	Page
PB 156 941	S-62
PB 161 251 canceled	S-39
PB 161 536 canceled	S-49
PB 161 582	S-49
PB 161 585	S-61
PB 171 109	S-1
PB 171 320	S-63
PB 171 516	S-27
PB 171 517	S-32
PB 171 547	S-42
PB 171 621	S-31
PB 171 623 canceled	S-39
PB 171 624 canceled	S-39
PB 171 683	S-30
PB 171 733	S-19
PB 171 734	S-17
PB 171 735	S-19
PB 171 736	S-21
PB 171 737	S-18
PB 171 738	S-17
PB 171 739	S-18
PB 171 740	S-19
PB 171 741	S-18
PB 171 742	S-20
PB 171 743	S-19
PB 171 744	S-20
PB 171 745	S-18
PB 171 746	S-19
PB 171 747	S-20
PB 171 748	S-21
PB 171 749	S-19
PB 171 750	S-21
PB 171 751	S-18
PB 171 752	S-18
PB 171 753	S-19
PB 171 754	S-18
PB 171 755	S-17
PB 171 756	S-20
PB 171 757	S-17
PB 171 758	S-17
PB 171 759	S-20
PB 171 760	S-21
PB 171 761	S-21
PB 171 762	S-39
PB 171 763	S-17
PB 171 764	S-20
PB 171 765	S-17
PB 171 766	S-17
PB 171 767	S-17
PB 171 768	S-20
PB 171 769	S-20
PB 171 770	S-53
PB 171 771	S-20
PB 171 772	S-39
PB 171 833	S-62
PB 171 842	S-50
PB 171 843	S-40
PB 171 844	S-15
PB 171 845	S-54
PB 171 846	S-30
PB 171 847	S-30
PB 171 848 canceled	S-6
PB 171 849	S-49
PB 171 855	S-57
PB 171 860 canceled	S-28
PB 171 861 canceled	S-28
PB 171 864 canceled	S-28
PB 171 865 canceled	S-29
PB 171 866 canceled	S-29
PB 171 867 canceled	S-29
PB 171 869	S-63
PB 171 870	S-62
PB 171 871 canceled	S-44
PB 171 878	S-42
PB 171 879	S-43
PB 171 881	S-50
PIBAL-272	S-38
PIBAL-631	S-38
PIBAL-636	S-37
PLES-C25-61(U)59	S-49
PLES TR-106	S-49
POLYRDC-8.2	S-23
PPL-TR-60-21(241)	S-58
PPL-TR-61-1	S-51
PPL-TR-61-4(258)	S-23
PU AEL-404	S-14
RADC-TN-55-21	S-52
RADC-TN-57-347	S-24
RIAL 54-849	S-32
RIAL-61-543	S-32
RIAL-61-544	S-27
RIAL-61-675	S-42
RLES EP-4419-106-61U	S-9
RPI TR-AE-6103	S-38
RPI TR-AE6104	S-38
RW-1631.84	S-54
SC-4573(RR)	S-24
SC-4591(RR)	S-61
SC-4608(RR)	S-50
SCDR-337-60	S-48
SCNC-311	S-31
SCTM-74-61(72)	S-10
SCTM-103-61(71)	S-28
SL-1868	S-48
SRAI pub-13	S-60
SRI-3245	S-10
STL/EM-8-12	S-39
STL/GM-TR-0165-00409	S-39
SUI-60-11	S-9
SURI-EE-655-608-TR1	S-52
TID-3908	S-4
TID-3909	S-4
TID-4900	S-31
TID-4901	S-46
TID-5762 (Vol. I, Suppl. I)	S-47
TID-7597 (Vols. I & II)	S-48
TID-7602 (Pt. 1)	S-31
TID-7603	S-40
TID-7604	S-48
TID-7606	S-5
TID-11514	S-40
TID-11851	S-49
TID-12439	S-4
TREC-61-49	S-30
TREC-61-50	S-30
TREC RTM-33	S-30
UCLA DE-61-3	S-33
UCRL-6220	S-47
UCRL-6356	S-51
UCRL-9388	S-60
UCRL-9511	S-50
UCRL-9566	S-5
UCRL-9589	S-48
UCRL-9595	S-49
UCRL-9597	S-49
UCRL-9601	S-58
UCRL-9603	S-45
UCRL-9610	S-49
UCRL-9617	S-4
USCEC-83-204	S-52
USL-326	S-40
USNRDL-TR-148	S-31
USNRDL-TR-444	S-5
USNRDL-TR-447	S-46
USNRDL-TR-451	S-4
USNRDL-TR-459	S-46
WADC-TR-58-596	S-36
WADC-TR-59-118	S-5
WADC-TR-59-423	S-59
WADD TN-60-242	S-62
WADD TN-60-246	S-63
WADD TN-60-305	S-44
WADD TR-60-580, pt. 3	S-42
WADD TR-60-675	S-13
WADD TR-60-699, v. 3	S-28
WADD TR-60-699, v. 4	S-28
WADD TR-60-699, v. 7	S-28
WADD TR-60-699, v. 8	S-29
WADD TR-60-699, v. 9	S-29
WADD TR-60-699, v. 10	S-29
WADD TR-61-25	S-43
WAPD-238	S-39
WAPD-TM-216	S-35
WCAP-1432	S-48
WILM-1037	S-24
WSU RR-2	S-2
WSU RR-3	S-3
WT-741	S-44
Y-1340	S-31

U. S. DEPARTMENT OF COMMERCE FIELD OFFICES

SERVE THE BUSINESS COMMUNITY

The Department of Commerce maintains Field Offices to enable the business community to avail itself locally of Government facilities designed to promote commerce. Working closely with various units in the Department and, when necessary, with other Government agencies, the Field Offices provide business services to manufacturers, wholesalers, retailers, trade publications, trade associations, advertising agencies, research groups, financial institutions, and exporters and importers.

Experienced personnel will gladly assist in the solution of specific problems, explain the scope and meaning of regulations administered by the Department, and provide practical assistance in the broad field of domestic and foreign commerce. Field offices act as official sales agents of the Superintendent of Documents, and maintain an extensive business reference library containing periodicals, directories, publications and reports from official as well as private sources.

Among the many services which businessmen have found of value are:

GENERAL

- Management and business aids
- Establishing a new business

BASIC ECONOMIC DATA

- Census data, with national and often State and regional breakdowns, on manufacturing, wholesaling, retailing, service industries, employment and unemployment, population, housing, agriculture
- Basic records of national income and product, regional trends, balance of payments, foreign aid

MARKETING AND DISTRIBUTION

- Development and maintenance of markets
- Distribution channels, facilities and services
- Marketing and distribution statistics

PRODUCTION

- Modernization of plant processes and other technological aids
- Development of new products
- Government-owned patents for free license
- Commodity standards

FOREIGN TRADE AND INVESTMENT

- Tariff and exchange regulations
- Import and export quotas, licensing regulations
- Statistics on imports and exports
- Investment and trade opportunities abroad
- Economic conditions in foreign countries

COOPERATIVE OFFICES

To make the services of the Department of Commerce more widely available, agreements have been entered into with more than 750 Chambers of Commerce, Manufacturers Associations, and similar business groups under which these organizations have become official Cooperative Offices of the Department. If specific information is not on hand in the Cooperative Office, your problem will be referred to the nearest Departmental field office.

Department Field Offices

ALBUQUERQUE, N. MEX., U.S. Courthouse.
ATLANTA 3, GA., 604 Volunteer Bldg.
BOSTON 10, MASS., Room 230, 80 Federal St.
BUFFALO 3, N.Y., 504 Federal Bldg.
CHARLESTON 4, S.C., Area 2, Sergeant Jasper Bldg., West End Broad St.
CHEYENNE, WYO., 207 Majestic Bldg.
CHICAGO 6, ILL., Room 1302, 226 W. Jackson Blvd.
CINCINNATI 2, OHIO, 809 Fifth Third Bank Bldg.
CLEVELAND 1, OHIO, Federal Reserve Bank Bldg.
DALLAS 1, TEX., Room 3–104 Merchandise Mart.
DENVER 2, COLO., 142 New Customhouse.
DETROIT 26, MICH., 438 Federal Bldg.
GREENSBORO, N.C., 407 U.S. Post Office Bldg.
HOUSTON 2, TEX., 610 Scanlan Bldg.
JACKSONVILLE 1, FLA., 425 Federal Bldg.
KANSAS CITY 6, MO., Room 2011, 911 Walnut St.
LOS ANGELES 15, CALIF., Room 450, 1031 S. Broadway.
MEMPHIS 3, TENN., 212 Falls Bldg.
MIAMI 32, FLA., 408 Ainsley Bldg.
MINNEAPOLIS 1, MINN., 304 Federal Bldg.
NEW ORLEANS 12, LA., 333 St. Charles Ave.
NEW YORK 1, N.Y., Empire State Bldg.
PHILADELPHIA 7, PA., Jefferson Bldg.
PHOENIX, ARIZ., 137 N. Second Ave.
PITTSBURGH 22, PA., 107 Sixth St.
PORTLAND 4, OREG., 217 Old U.S. Courthouse and P.O. Bldg.
RENO, NEV., 1479 Wells Ave.
RICHMOND 19, VA., 309 Parcel Post Bldg.
ST. LOUIS 1, MO., 910 New Federal Bldg.
SALT LAKE CITY 1, UTAH, 222 SW. Temple St.
SAN FRANCISCO 11, CALIF., Room 419 Customhouse.
SAVANNAH, GA., 235 U.S. Courthouse and P.O. Bldg.
SEATTLE 4, WASH., 809 Federal Office Bldg.

For local telephone listing, consult section devoted to U.S. Government

UNITED STATES
GOVERNMENT PRINTING OFFICE
DIVISION OF PUBLIC DOCUMENTS
WASHINGTON 25, D. C.

OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE TO AVOID
PAYMENT OF POSTAGE, $300